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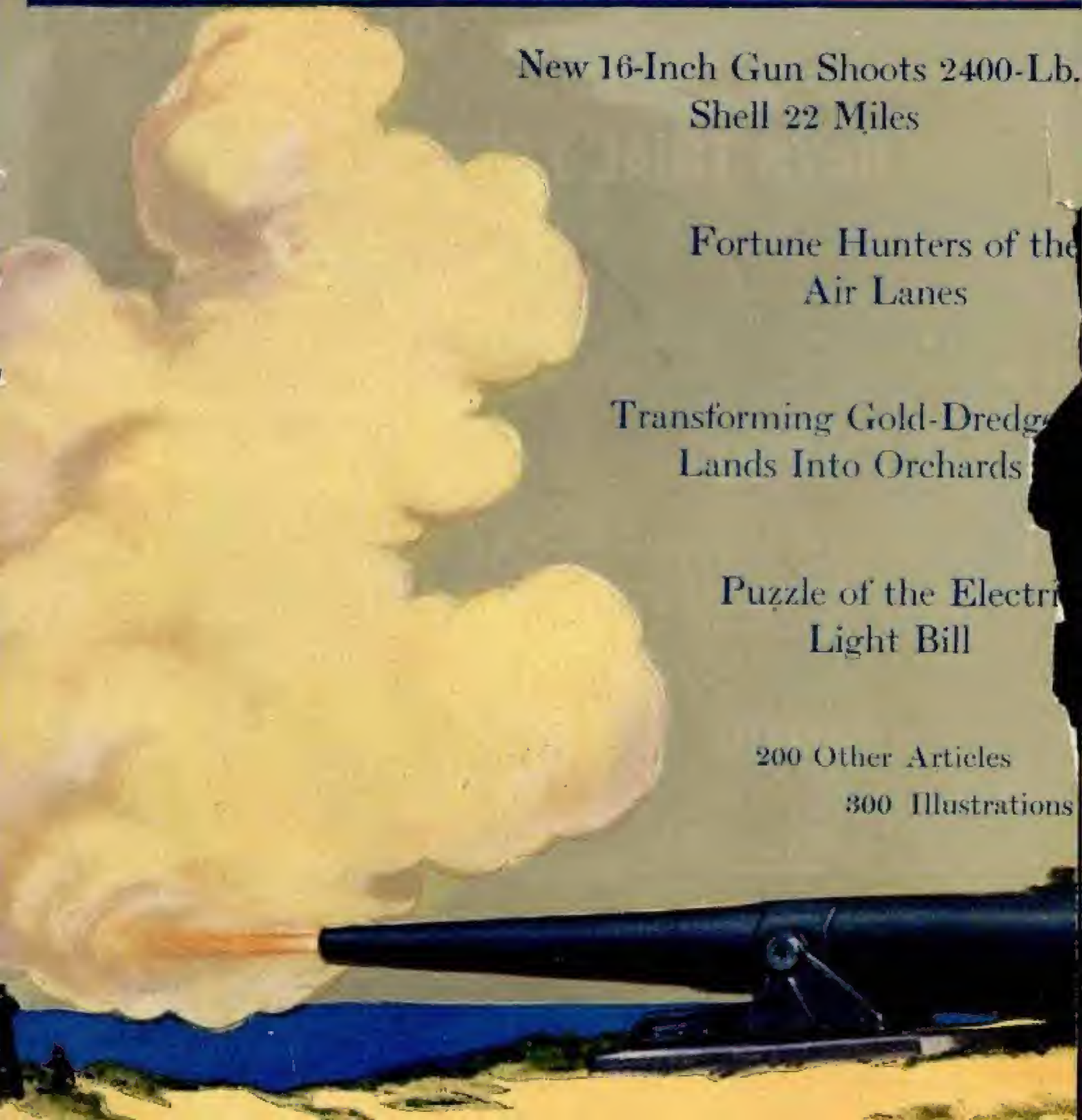
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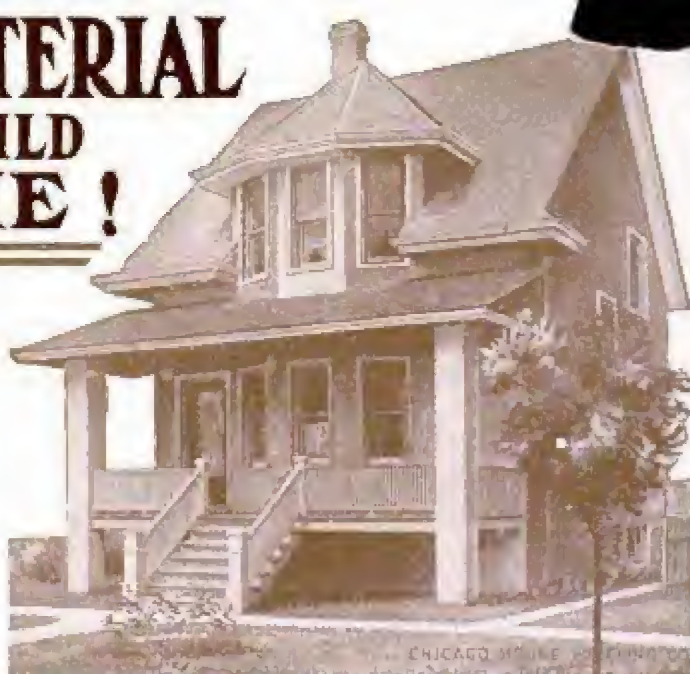
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Contents for November, 1911

An Ingenious Automobile Camp Outfit.....	617
Combined Kitchen Sink and Bathtub.....	618
New Yorker Plans Fence 150 Feet High.....	618
Laying the Keel of the "New York".....	619
Powerful Fire Engine with Gasoline Pump.....	620
New York's Unique Art Colony.....	621
Electric Yacht Operated by Wireless.....	622
Fountain Ruling Pen.....	622
To Warn Airmen of Thunderstorms.....	622
Temperature Has Much to Do with Corrosion.....	622
Catches Water Bird with Casting Bait.....	623
Runaway Engine Crashes through Depot.....	623
Forcing Plant Growth by Hot-Water Baths.....	624
X-Ray Motion Pictures.....	624
Adjustable Windshield for Automobiles.....	625
Smuggling Chinese over the Border.....	625
This Dog is Happy with a Peg Leg.....	626
City Streets Inundated by Molasses.....	626
Hydraulically Compressed Air Loses Oxygen.....	626
New Cotton Gin Removes All Lint.....	628
British Motorcycle Field Artillery.....	628
Fortune Hunters of the Air Lanes.....	629
By Victor Loughheed	
Guinea Pigs as Lawnmowers.....	632
Breakfast Food Fed to Locomotive.....	632
Instantaneous Coffee Heater.....	633
Cork Varnish for Ship Interiors.....	633
Bleriot Builds a Sand-Sailing Craft.....	634
What a Misplaced Comma Can Do.....	634
Extracting Safety Pin from Throat.....	634
Steamboat Made of Apples.....	635
Electricity in the Air Blamed for Ills.....	635
Quaint Toys Designed by Famous Artists.....	636
Another Petroleum Waste Found Useful.....	636
The Triplane "Astra".....	637
Eight-Wheeled Touring Automobile.....	637
Signaling Headlight for Trains.....	638
Collapsible Cores for Concrete Houses.....	638
Cutting Asphalt with Pneumatic Hammers.....	639
Captured Russian Gun a War Monument.....	640
New Alpine Tunnel Proposed.....	640
Straw as Road-Making Material.....	640
Combined Electromagnet and Trouble Lamp.....	640
To Transform a City into a World's Fair.....	641
Swiss Locomotives Have Stack Lids.....	642
Submerged Forest Found in Russian River.....	642
Experts Believe Large Mine Sank "Maine".....	647
Basketball as Football Practice.....	646
The "Game Not Worth the Candle" Kills Eleven.....	657
New 16-In. Gun Shoots 2400-Lb. Shell 22 Miles.....	657
Do Propellers of Monster Ships Cause Dangerous Suction?.....	649
Giant Cheese Weighs Over Five Tons.....	650
French Battleship Blown Up in Toulon Harbor.....	651
England and the United States Experiment with Aeroplanes in the Postal Service.....	654

Baseball Makes the Whole Country Kin.....	656
Comment and Review.....	643
By H. H. Windsor	
The Puzzle of the Electric Light Bill.....	659
By Henry Tarkington	
Building Collapses from Faulty Construction.....	663
Rat Photographs Himself.....	664
France Building Monster Sailing Ship.....	664
Wooden Water Mains Used One Hundred Years Ago.....	664
Coal and Iron Refuse as Building Material.....	665
The Sand-Blast Costume.....	665
Bill-Posting Crew is Hoisted by Derrick.....	665
House Has Street-Car Bay Windows.....	666
One-Hundred-Foot Bridge of Bamboo.....	666
Mammoth Drydock for Big Battleships.....	666
Dynamiting a Flour Mill.....	666
Oklahoma Postoffice Made of Piano Box.....	667
English Regard Canal Purchase a Bargain.....	668
New \$3,000,000 Hospital for Chicago.....	669
Unusual Task for Auto Truck.....	669
Typewriter for the Blind.....	670
Burn Two Billions in Bonds to Save Coal.....	670
Completion of Elizabeth Tunnel.....	671
By Burt A. Heinly	
Motion Pictures of Stump Blasting.....	672
Artificial-Wood Matches.....	672
Automatic Side-Shifting Street-Car Lever.....	673
Old Punishment for Drunkards.....	673
A Non-Freezing Waterspout.....	674
Compartment Plates for Quick Lunches.....	674
A Vacuum Cleaner for Library Books.....	675
By Roy O. Randall	
Loggers Operate Truck Brake with Crank.....	676
Two Severe Railroad Tests.....	676
Clothes That Make the Wearers Non-Sinkable.....	677
Moving a Grindstone in China.....	678
A Basic Patent.....	678
Replace Old Bridge by New in 49 Seconds.....	679
A Record Sale of Ivory.....	680
Dual-Control Automobile.....	680
Colossal Reredos for an American Church.....	681
Tree Makes Railroad Curve Its Line.....	681
U. S. Warships to Have Incinerators.....	681
Caterpillar Automobile for Alaska Snows.....	682
Electric Fan Shows Perfume.....	682
New Mute for Violins.....	682
Two Ingenious Clocks.....	683
Coiffure over Six Feet in Height.....	684
A New Idea in Auto Ambulances.....	684
New German Refrigerator Cars.....	684
Wealth in Lignites.....	685
By Guy Elliott Mitchell	
Fence Made of Gun Barrels.....	686
Army Surgeons Score a Real Victory.....	687
Continuous Unloader for Railroad Fills.....	688
Photographing Duration of Explosions.....	689

[Continued on Page 6]

Popular Mechanics offers no premiums; does not join in "clubbing offers," and employs no solicitors to secure subscriptions. It is for sale by nearly every newsdealer in the United States and Canada.

101

Polished Floors	742
Repairing Tin Gutters	743
Heel Support for Automobile Drivers	743
Cutting Small Gears in a Lathe	743
Cutting Miters	743
Pipe and Rod Storage Rack	744
Depth Cutting in a Lathe	744
Waterproofing Blueprints	745
Retapping a Die	745
Fireproof Paste for Furnaces	745
Anchoring Beams to Rocks	745
Lantern Hanger for a Barn	745
Holder for a Handsaw	746
How to Clean Brass	746
Fastening Leader Pipes in Soil Pipes	746
Centering Bolt Heads	746
Repairing a Whipstock	747
An Adjustable Spacing Collar for Arbors	747
Rule for Smokestack Pitch Top	747
Ventilating at the Top and Bottom of Windows	748
Bending Short Pieces of Pipe	748
Finding Polarity of Electric Wires	748
Air-Tight Connection for Underground Tank	748
Hose Connections	749
Rotary Marking Gauge	749
Wood Turning with a Ripsaw	749
Putting an Eye in a Wire Rope	749
Laying a Plank Sidewalk	749
Mayonnaise Mixer	750
Depositing Copper in Glass	750
Removing Flanges from Shafting	750
Writing on Blueprints	751
Placing Fibroid Filler in a Friction-Drive Automobile	751
Window Sash Lock and Adjuster	751
Cooling Work in a Lathe	751
Lever for Laying Flooring	752
Making Use of a Table-Board Case	752
Green-Gold Finishes	752
Rejuvenating Old Awnings	753
A Soft-Faced Hammer	753
Turning Pipes with Files	753
Shifting Gears on an Automobile	753
Protecting Pool Edges in a Chest	753
Boring in a Drill Press	754
Preventing the End Grain of Wood from Checking	754
Cleaning Brass Fixtures	754
Smooth Edge on a Drawing Board	754
Substitute Turnbuckles for Aeroplanes	754
Thread-Cutting Dies	755
Preventing Work Chattering in a Lathe	755
Holding Screws while Filing	755
Gaskets for Automobile Transmission	755
Cutting Brass Tubes	755
Strengthening a Hammer Handle	756
Distock Extension	756
Turning a Typewriter Ribbon	756
Keeping Lines from under the Ends of Single-trees	756
Stavbolt Repair on a Boiler	756

AMATEUR MECHANICS

Homemade Electric Stove.....	757
Automatic Closing Kennel Door.....	758
Polishing Cloths for Silver.....	758
A Book-Holder.....	758
Clamping a Cork.....	759
Withdrawing Paper from under an Inverted Bot- tle.....	759
Broom Holder Made of a Hinge.....	759
Making Proofs before the Negative Dries.....	759
Flower-Pot Stand.....	759
A Line Harmonograph.....	760
Cutting Circular Holes in Thin Sheet Metal.....	761
Key Card for Writing Unreadable Post Cards.....	761
Homemade Carpenter's Vise.....	762
Toning Blue on Bromide and Platinum.....	762
Cutting Loaf Bread.....	762
How to Make an Electric Toaster.....	763
Cabinet for the Amateur's Workshop.....	763
Soldering for the Amateur.....	764
Washboard Holder.....	765
A Mission Bracket Shelf.....	765
How to Make a Finger Ring.....	765
How to Bind Magazines.....	766
Metal Coverings for Leather Hinges.....	767
<hr/>	
Interesting Patents, Practical or Unique.....	768
Jokes.....	770
New Books.....	770

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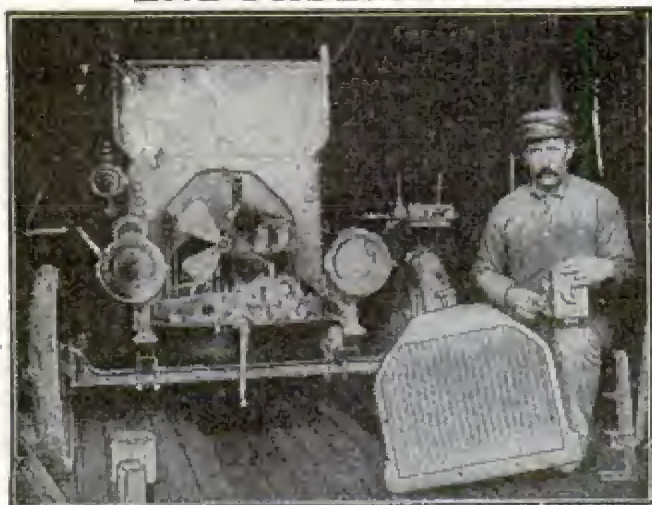
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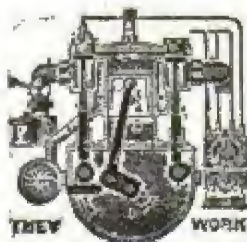
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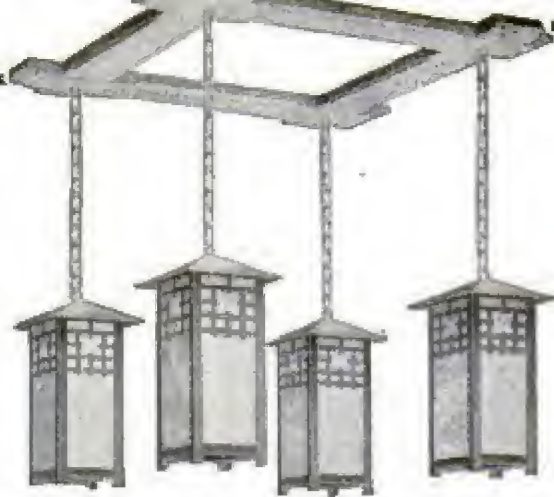
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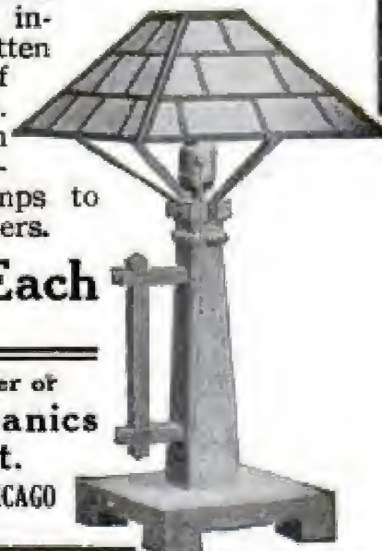
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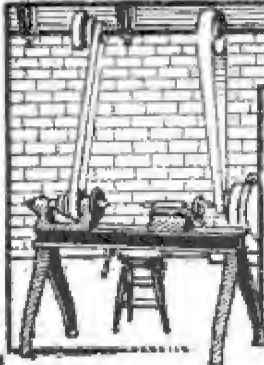
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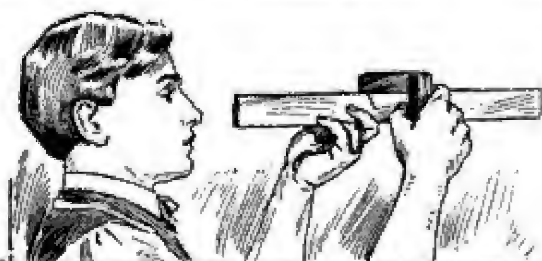
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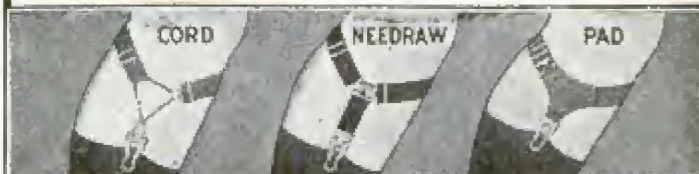
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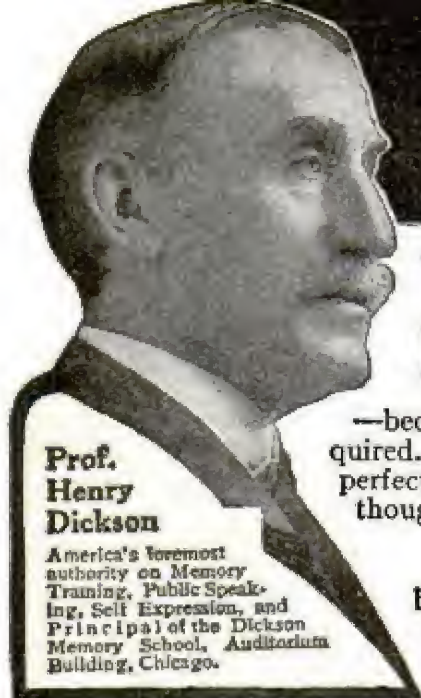
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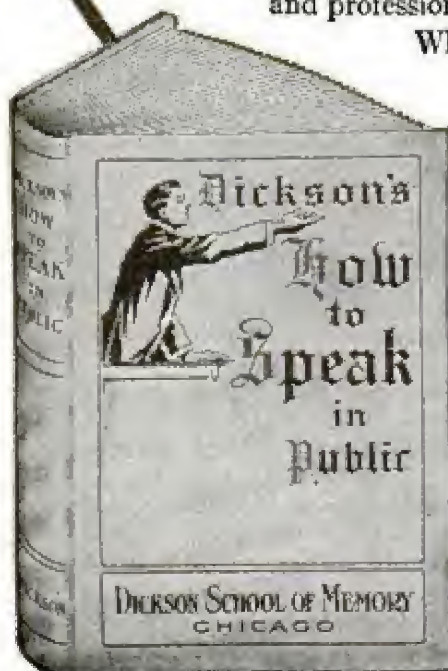


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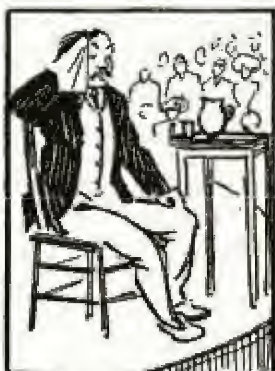
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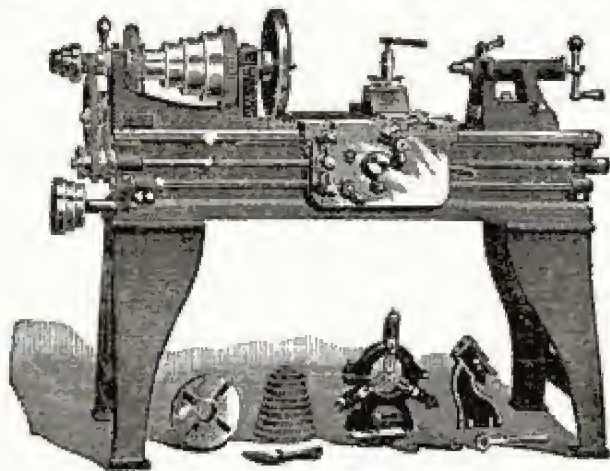
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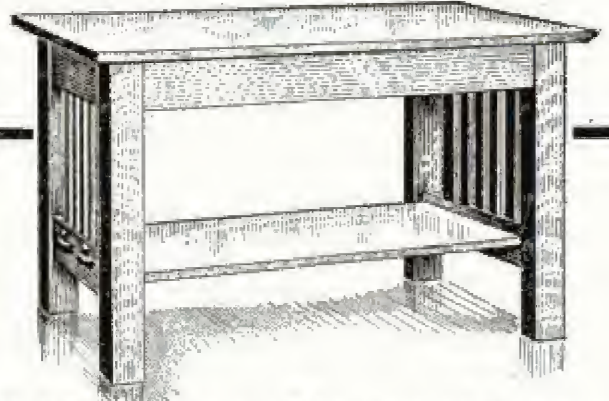
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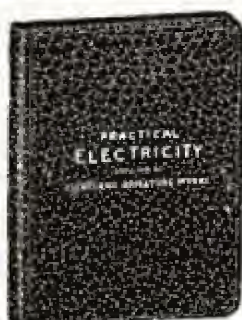
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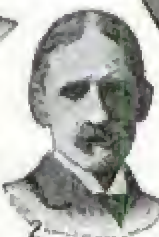
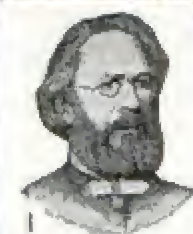
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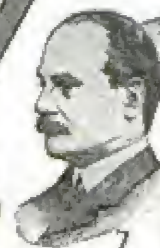
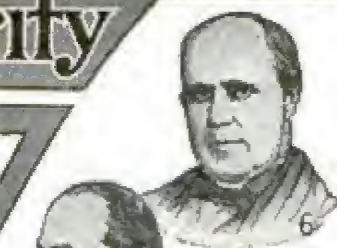
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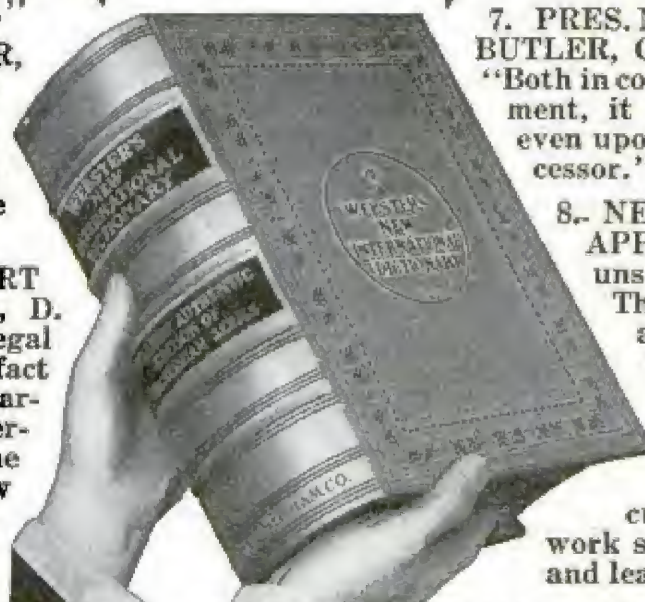
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LEARN THE ART of silvering mirrors at home, complete instructions, 25c. A. Clark, 2019 N. Carlisle, Philadelphia.

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HOUSTON, TEXAS, the railroad, cotton, lumber, rice and oil center of the South, offers unequalled advantages to manufacturers. Houston will encourage and support a Wagon Factory, Gin Machinery Factory, Tool Handle Factory, Furniture Factory, Coopers Plant, etc. Houston is the supply depot for the great Gulf Coast country. For better advantages, come to Houston. Write for specific information. Address, Chamber of Commerce, Houston, Texas.

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HAVE YOU ANYTHING TO ADVERTISE? Our Rate Book tells you all about advertising mediums, rates, circulation, closing dates, etc. Sent for 10c. Worth dollars. Folder free. Correspondence invited. Dearborn Advertising Agency, 455 Franklin Bldg., Chicago.

WE START YOU in a Permanent Business with us and furnish everything. We have new easy selling plans and seasonable leaders in the mail order line to keep factories busy. No canvassing. Small capital. Large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. J. M. Pease Mfg. Company, 181 Pease Bldg., Michigan St., Buffalo, N. Y.

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MAKE MACHINE for forty cents to make artificial building stone. Directions and License, fifty cents. William Barten, Gordon, Nebraska.

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75 TRICK ESQUIMOS, WHITE, intelligent, shaggy and handsome. 25 Pointers. One English Bull. Brockway's Kennels, Baldwin, Kansas.

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NEW SUIT OFFER! Just send us your name and you will promptly receive the most astonishing—yes, wonderful suit offer, together with Paragon Complete Outfit, packed with big assortment of Cloth Samples, Tape Measure, Fashion Figures, Order Blanks, etc.—all absolutely Free by Return Mail, Postpaid. This includes an offer on a fine suit for yourself so liberal it will startle you, and our Grand Offer to start you in a big money-making business for yourself. Our wide-open terms, conditions and privileges will astonish you. The low prices we will make you on men's high-class clothes will amaze you. And we pay all express charges. We go to the limit in liberality. We want you for our agent in your town, so that we can turn all our business over to you. We will start you in a big, established, money-making business. New agents make \$40 a week. Do you wonder that our agents make all kinds of money? We must have an agent in your town. Get our Grand Offer and the Special Paragon Outfit, which is already packed with big Assortment of Cloth Samples and complete equipment, ready to be sent you free, charges paid by us. "First Come, First Served." Rush your answer to us quick if you want a suit for yourself, before some one else gets the prize. Address Dept. 11, Paragon Tailoring Co., Chicago, Ill.

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AGENTS—You can make from five to ten dollars every day easy, selling 1,000 rings, no two alike; 200 chains, 250 cuff buttons, 200 emblem buttons, 30 neckties, 50 bracelets, 100 scarfpins, 40 thimbles, 100 brooches, 100 lockets, 20 pipes, 72 diamonds, 120 watches, 100 pendants, 57 necklaces, 18 scissors, 25 pocket knives, 24 souvenir spoons, 33 toilet articles, 10 fountain pens, 16 mesh bags, 25 belt buckles, 15 carving sets, 100 holiday post cards, 41 napkin rings, 14 patterns of tableware, razors, leather goods and hundreds of novelties in our new, big, fall and Christmas catalogue; big cash profits and extra premiums for everybody. \$1,000.00 worth of diamonds, gold watches and valuable prizes distributed among agents January first. Experience unnecessary, new selling plan makes several customers at every house, signed guarantee with everything; write immediately for territory and new catalog. A. W. Holmes & Co., Dept. G-4, Providence, R. I.

AGENTS MAKE 100% PROFIT selling the Victoria Suction Carpet Sweeper. Powerful suction in connection with brush. Adjustable to every floor covering. Easy running. Dusts as it sweeps. Established 26 years and now better than ever. Sells itself and makes you independent. Our free advertising cuts your work in half. Write today. Booklet free. Milford Mfg. Co., 17 Mill St., Milford, Ohio.

MY! HOW THEY FALL for our "Lucky Seven" toilet combination (\$3.20 value). You sell for \$1.00. Other fellows making \$0, \$12, \$15, \$20 and \$25 daily. Our big Xmas Specials now ready. Great crew managers' proposition—good for \$100 profit weekly. This is only one pippin in our "27 varieties" we manufacture—you save middleman's profit. Our new colored circular is like seeing the real goods. Free to workers. Get aboard. Act today. Davis Soap Works, 264 Davis Bldg., 1429 Carroll Ave., Chicago, Illinois.

WANTED—ONE GOOD MAN in each town to take orders for made-to-measure clothes. Up-to-date styles, very low prices; orders come easy. High-class permanent business; splendid profits, \$5.00 a day and up. No money or experience needed. We ship on approval, express prepaid, and guarantee perfect fit. Write for territory, terms and free samples. Banner Tailoring Co., Dept. 248, Chicago.

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MAN WANTED AS EXCLUSIVE AGENT. Self-wringing mops. We manufacture six styles for all purposes including an absolutely new combination scrubbing brushmop that is self-wringing. Every woman wants this. Proven success. New, inexperienced men make \$9 per day, one man made \$120 the second week. No investment. Send for prices, free catalogue and exclusive territory proposition that will make you independent. Edward Hiker Mop Co., 1195E Grand Ave., Chicago, Ill.

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AGENTS HAVE STEADY INCOME selling our Novelty Changeable Signs, gold and silver letters, in demand everywhere. Catalogue. Climax Novelty Co., 452 Gay Bldg., St. Louis.

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IT COSTS YOU NOTHING to learn how to double your income handling our fast seller. Ask for particulars. V. B. Matthews, Box 212, Miami, Tex.

FREE SAMPLE goes with first letter. Something entirely new. Every firm wants it. Orders \$1.00 to \$100.00. Nice, pleasant business. Write today. Metallic Sales Co., 406 N. Clark, Chicago.

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OPPORTUNITY TO ESTABLISH PROFITABLE AGENCY Representatives wanted for moderate priced office specialty of great merit; extensively advertised. Exclusive territory and assistance in making sales. Scofield Company Manufacturers, 1950-1955 American Tract Society Building, New York.

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AGENTS I have a good money making formula called Shining Cloth; cleans and polishes all metals, silverware, brass, etc. Send 25c silver. Charles J. Mink, Dept. 7, 1332 W 19th St., Chicago.

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AGENTS—We manufacture four of the most fascinating game boards ever invented, 100% profit, orders bound to repeat, nothing like them on market, slot machines beat. Particulars free. Unique Novelty Co., Independence, Iowa.

SALESMEN, AGENTS, REPRESENTATIVES. Write White Vending Co., 1335 Van Buren, Chicago. Big commissions paid promptly for selling our Vending Machines.

AGENTS EVERYWHERE can make big income distributing Coupons advertising our Gum. No canvassing. Liberal yearly contract. Send seven two-cent stamps for Supply Coupons, Samples Gum and Instructions. Spearmint Company, 1777 Broadway, Department 19, New York.

AGENTS—Portraits 35c; frames 15c; sheet pictures 1c; stereoscopes 25c; views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait, Dept. 1198, 1027 W. Adams St., Chicago.

AGENTS WANTED—Latest high grade sanitary specialty. Every home, hotel, factory and office buys on sight. The Watrous Co., 1672 Fisher Bldg., Chicago.

KEY CHECK OUTFITS for stamping names on key checks, fobs, etc. We sell blank checks, key rings, steel letters, etc. Sample key check marked with name and address, 25c. Price refunded with \$1 order. Agents wanted. Pease, Die Maker, Winchester, N. H.

AGENTS, AND MAIL ORDER SPECIALTIES that sell, 150 to 500 per cent profit's. No chance proposition. Success absolutely certain. Circulars furnished. Three samples for dime. Free particulars. Poulsen Manufacturing Company, 213 East Tenth Street, New York.

AS YOU CAN CLEAR \$5 daily, year round, mailing music evenings, why look further? Send 10c for facts, proof and beautiful new sheet music to Weber Music Co., 3527, Boston, Mass.

AGENTS WANTED—Send 15 cents for smallest Bible in the world and one of each of our catalogues, with agent's prices. A. S. Mankin & Co., Alexandria, Va.

PORTRAIT AGENTS—Crayon, Pastel and Sepia portraits, Frames, Sheet pictures, etc. Good work. Prompt shipments. Catalogue and samples free. Hyde Art Co., X. 4535 N. Ashland, Chicago.

2500 DIFFERENT WAYS for making money in Mail Order business, each plan fully explained. Send for particulars. Washington Herman Co., 58th & Spruce, Philadelphia, Pa.

AGENTS WANTED to introduce Matchless Gaslighters. Light nothing but gas. Sample 15c. Particulars free. Elwell-Shaver & Co., Dunkirk, N. Y.

AGENTS WANTED to sell our beautiful scripture wall mottoes. Frank Shilling Co., Navarre, Ohio.

AGENTS MAKE \$30.00 WEEKLY selling our 500 Handy Household Articles; catalogue free. Scheff Company, 1637 Wells Street, Chicago.

10,000 GOVERNMENT POSITIONS OPEN. Write for List. Franklin Institute, Dept. O-21, Rochester, N. Y.

LARUES PINE TAR PASTE, and Velvety Paste are high grade, down to date, cleaning specialties which competition has not touched. No live agent or dealer can afford to be without them. Samples 10c prepaid. F. C. LaRue Soap Co., Department 8, 584 Niagara St., Buffalo, N. Y.

\$DOLLARS\$ ADDER—Pocket Adding Machine. Wonderful seller. Guaranteed. \$1 postpaid. Globe Sales Co., N1711 Leavenworth, Omaha, Neb.

QUIT HARD WORK and impossible propositions! Start a business of your own; make more money. "Money Making Secrets Exposed" contains the best Mail Order and Agency propositions. All brand new; good for an income for life! Write for free descriptive circular. L. Whatley, 414 Genesee, Saginaw, Mich.

HERE'S YOUR OPPORTUNITY—I want you to market Brand New Imported useful articles, unusual merits; sells on sight; small price, profits high; market unlimited; no competition. Particulars free. John Regan, 32 Union Square, Dept. H., New York.

IF YOU ARE TIRED OF WORKING for other people; if your income is too small, or if you are looking for something to do during your spare time, write me for my big money making propositions. Palmer, Box 155, Weyburn, Sask, Canada.

AGENTS, best proposition ever, for live wires. One such, Atlantic City, made \$1,624 in five weeks selling our proposition. Write John D. Long, Two Twenty Broadway, New York.

I HAVE 5 DANDY NEW ARTICLES to manufacture at home. All big profit payers. Particulars free. P. Benson, Stewartville, Minn.

AGENTS—Handle our nameplates, signs, numbers, etc., and make \$5 profit daily, samples free. Brett Brothers, Boston, Mass.

AGENTS—Over 500% profit, Gold and Embossed Sign Letters. Sample free. Johnston Co., Quincy, Ill.

GEOMETRIC FRACTION ADDERS combine speed accuracy and simplicity in adding and subtracting fractions of an inch. Send 10 cents for adder and agent's proposition. E. Lawrence, Box 422, New Britain, Conn.

LIVE AGENTS wanted to introduce article which helps reduce household expenses; particulars free; write immediately. A. F. Nielsen Co., 246 Silver St., S. Boston, Mass.

THE NEW INSTANTANEOUS FRACTION COMPUTER, computes fractions mechanically without mental calculation. 50c postpaid. Agents wanted. Numerometer Mfrs., 3035 Archer Ave., Chicago, Ill.

"TRIP AROUND WORLD"—"TOUR AMERICAN CONTINENT", 50 water color postcards in attractive boxes. Both sets 25c postpaid. Big profits. Secor Company, 502 West 122 Street, New York.

MAKE \$25.00 DAILY. A reliable firm wants an exclusive agent. New invention; write today; name your county. Aerio Co., Z 200, Cincinnati, Ohio.

MEN AND WOMEN AGENTS to sell record book—sells at sight. Big profits. Particulars free. Trade News, Stillwater, Minn.

RAILWAY MAIL CLERKS WANTED—Average salary \$1,100. Write immediately. Franklin Institute, Dept. O-21 Rochester, N. Y.

AGENTS—\$5 per day assured; most rapid selling 25c home necessity on earth; sells everywhere; send 10c for sample outfit; write today. Morehouse Supply Co., Des Moines, Ia.

FIVE PATENTED HOUSEHOLD NECESSITIES—Men and Women Agents Wanted. Sample Free to Workers. Sterling Mfg. Co., Villa St., Racine, Wis.

BIG MONEY for Hustlers, selling specialty soon required by Government in every household. Address, Fellowship Exchange, 220 Broadway, New York.

AGENTS—Have high grade proposition, Sample with circulars, 25c coin. Santos Distributing Co., Westfield, Mass.

AGENTS—\$35 WEEKLY selling our new family article. Lutz Bros., Milan, Ohio.

AGENTS—New household necessity. Every woman buys. 140% profit, sample 12 cents. H. Hamblett, 9 Ellingsburg St., Lowell, Mass.

WANTED—AGENTS, 7 cents profit each 10 cent sale; best little article ever offered; sample for 3 cents in stamps. Rawlings Box 945, St. Louis, Mo.

AGENTS! DON'T HESITATE; write at once. We will positively show you how to make \$25 every day. Address Geo. R. Hoagland Co., 928 Wyandotte St., Kansas City, Mo.

SMALLEST ALARM CLOCK, bible and telescope, 10c each prepaid. W. H. Garner, A-119 South Lafayette St., Evansville, Indiana.

BEAUTIFUL, Brilliant, Dazzling. Finest Imitation Diamond on earth, Pin or Stud, 25 cents. C. P. Graves, Midland, Texas.

AGENTS \$200 month upwards. Staple specialty. Big demand. Exclusive territory. Write now. E. Z. Higgs, 16 N Market, Chicago.

\$100 monthly and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., M. V., Chicago.

DISTRIBUTE SAMPLES, \$25 weekly. Investigate. Mystik Company, Washington, D. C.

AGENTS—200% PROFIT. Sales guaranteed. "Little Clincher" Ice Creepers, the newest and greatest of winter necessities. American Sales Co., 108A West 32nd St., New York

AGENTS—THE ONLY PRACTICAL GUARANTEED cigar lighter on the market. Over 100 per cent profit when retailed for 25c each, 33 1-3 per cent profit when sold wholesale to cigar, drug or department stores. Send 25c for sample and particulars. Superior Novelty Works, 35 S. Dearborn St., Dept. K, Chicago.

AGENTS WANTED—Make big money—selling photo pillow tops, 25c; Bromides, 25c; Portraits, 35c; Oilettes, 30c. We produce works of art, guaranteed, lowest prices, largest studio, prompt service, credit given, samples, portrait and frame catalogue free. Daniel H. Ritter Co., 1218 Madison, Chicago, Ill.

AGENTS WANTED—For burglar proof key guard that makes your homes and stores safe against burglars and thieves. Sample and terms, 15 cents. Henry Friedenhelt, 318 Culbertson Bldg., Oklahoma City.

AGENTS—Framed pictures, 25c; portraits, 45c; sheet pictures, 3c; pillow top portraits; free catalogue; samples. Family Portrait Co., Dept. P. M., Wayne, Ill.

MAKE \$6 DAILY selling our specialty. Recommended by government. Write for sample and particulars. W. J. Riordan & Co., Orange, N. J.

MAN CLEARED \$1182. Lady \$720, last six months, selling Holladay's Marvel Shoe Polish, selfshining, waterproof. Why not you? Write for demonstrated sample. P. M. Holladay, 254 W. 31st, New York.

BLARNOK DIAMONDS. Big profits. Sample, 1k brilliant Scarf Pin, 10 cents. George Winstel, 1624 Pleasant Street, Cincinnati, Ohio.

WANTED—AGENTS AND REPRESENTATIVES to handle the first household utensil that pays for itself every week; nothing like it on the market. Laughlin Specialty Company, Dows, Iowa.

BRAND NEW WINNER that Sells, Sells, and Sells. 25c "Pelco" featherweight unbreakable Goggles; 200% profit. American Sales Co., 108-C West 32nd St., New York.

HONEST AGENTS earning under \$35.00 weekly; write for something better. Particulars free. F. Brown & Brown, 357 Fifteenth Ave., Columbus, Ohio.

GLASSOID PREVENTS GLASS STEAMING. All wearers of eyeglasses possible customers. 25c box to agents, 10c. The Glassoid Co., Worcester, Mass.

GLASSES WON'T SMOKE up if you use "Seeclear" cleans, 10c. Agents wanted, Evans Co., 2340-7th Ave., N. Y.

WANTED—SALES AGENTS for the Maxon Pat. Lever and Screw Lifting Jacks. The best jack on the market. Kinsey & Norton Mfg. Co., Cincinnati, Ohio.

HOME BUSINESS. Collect names, information, etc., for business concerns. Steady income. Instructive booklet for stamp. Information System, 260, Marietta, Ohio.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

AGENTS! MAKE MORE MONEY! Ask us how? American Sales Co., 108-B West 32nd St., New York.

WEeping DOLL. Latest patented top, very laughable. Progressive Novelty Co., Roslindale, Mass.

YOUR NAME AND ADDRESS on an air-cushion rubber stamp, 20c. Including pad, 30c. Smith Supply, Waukegan, Ill.

THE NEW "SWIFTLIT" Lamps light instantly with 1/8 match; like city gas; no alcohol used; radically different from any other; portable or systems, 100 to 1,000 candle power at will; burners cheap for old lamps; agents making money; great novelty; wholesale price for introduction. Planet Mfg. Co., Dept. 4, St. Louis. (Established 1868.)

ANYONE, ANYWHERE, CAN START a mail order business of their own. Make \$10 to \$50 a week during spare time; experience unnecessary; we, as manufacturers, start you and furnish everything. Patented great repeat order getters; sold exclusively to our co-workers; big profits; small capital; get in now on our new leaders and new plan; get in touch with full particulars. "Whole Truth" and sworn statement. Write today. J. M. Pease Mfg. Co., 193 Pease Bldg., Michigan St., Buffalo, N. Y.

MAIL ORDER ADS THAT PAY. 20 different propositions fully explained. All bona fide, sure-fire Money-getters. Each one the foundation of a successful Mail Order business. Send 10c for full particulars and regular bulletin of new propositions. Mail Dealers Wholesale House, 450 Franklin Bldg., Chicago, Ill.

MEN AND WOMEN WANTED to control exclusive agencies, rapid selling, low priced specialty. Universal demand, plenty repeat orders; good profit to hustlers. Write for free sample and terms to-day. The G. V. Sales Co., Room 1325, 150 Nassau St., New York City.

AGENTS WANTED—SELL RICH LOOKING imported 36x68 rugs, \$1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profits \$51. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Stonington, Maine.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 306, Boston, Mass.

HANDY TOOL HOLDERS save labor, time, money. Mechanics delighted. Fastest selling household device ever invented. Nickel plated pocket outfit, 5c. Big profits. Manager, 153 Lawrence St., Brooklyn, N. Y.

AGENTS—HANDKERCHIEFS, DRESS GOODS. Carleton made \$8.00 one afternoon; Mrs. Bosworth \$25.00 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 59 Main St., Brooklyn, N. Y.

AGENTS WANTED in every county to sell Transparent Handle Pocket Knives. Big commission paid. From \$75.00 to \$300.00 a month can be made. Write quick for terms. Novelty Cutlery Co., 57 Bar St., Canton, Ohio.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

GENERAL AND LOCAL AGENTS: Here is your opportunity. Energetic men can make \$2,500 yearly and up. The Improved Cancheater Kerosene Mantle Lamp revolutionizes old methods. Far superior to electricity, gas, acetylene or gasoline at 1/10 the cost. Burner fits all lamps. Safe; clean; odorless. Burns with or without mantle. Tested and pronounced by State of Pennsylvania "Most efficient light found." Greatest seller known. We want a few more live men in open territory. Cancheater Light Company, Dept. P. M., 204 N. State St., Chicago.

LIVE AGENTS WANTED. A permanent income selling Koeth Combination Kit, 15 tools in one. Finest tool steel, guaranteed. Big profits. Wonderful seller. Exclusive territory. Send for free sample offer and terms. Currier-Koeth Mfg. Co., 52 West St., Coudersport, Pa.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

AGENT'S OUTFIT FREE. Quick profits. Best Handkerchiefs, Dress Goods and Fancy Goods on the market. Large Manufacturer. Particulars for stamp. Maricopa Mfg. Co., 93 Water St., Brooklyn, N. Y.

HONEST MAN OR WOMAN WANTED in every town to represent well-known wholesale firm. Experience unnecessary. Must furnish good references. Easy, pleasant work. Fair salary to start. McLean, Black & Co., 351 Medford St., Boston, Mass.

BECOME A MILL AGENT. We manufacture Triplewear Hosiery—outwears 3 ordinary kind, replaced free when hole appears. Large profits. 1st reply obtains agency your town. Write today. Triplewear Mills, Dept. D, 724 Girard Ave., Philadelphia.

MEDALLIONS SELL AT SIGHT. 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 202 S. Clark St., Chicago.

WIDOWS, Ladies, Men, New Interesting. Profitable, easy work. Spare time or permanent. Sell our useful specialties. Our original selling plan will double your sales. Particulars and \$2.00 premium offer free. Fair Mfg. Co., HF51, Racine, Wis.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R., Cincinnati, Ohio.

SELF-THREADING NEEDLES. 10c a paper. Agent's samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

HANDY RAT TRAP. Great agents' seller. Terms free. Zerbe, Sacramento, Pa.

HELP WANTED

ARE YOU THE MAN? Here is your opportunity. No matter where you live—if you want to make big money and establish yourself in an independent business requiring no capital—we will teach you, by mail, all the secrets of the real estate business including thorough commercial law course, list with you readily salable properties, co-operate with and assist you to permanent success. Our 64-page free book fully explains our methods and tells what it means to be the local representative of oldest and largest Co-Operative Realty and Brokerage Corporation in the world. Write today to International Realty Corporation, 1934 Manhattan Building, Chicago, Ill.

ELECTRICAL METERMEN WANTED IN EVERY STATE—\$900-\$1,800 yearly. Rapid introduction of Electricity creating new positions daily. We will fit you for splendid position and assist you to get it. Booklet giving full particulars free. Write for it today. Fort Wayne Correspondence School, Dept. 20, Fort Wayne, Ind.

LEARN AUTOMOBILE ENGINEERING AT HOME, spare time. Easy to learn. Convenient payments; Auto Model free. Big demand; salaries increasing; we assist you to position. Free catalog. U. S. Correspondence Institute, Dept. 18, Elmira, N. Y.

WHY NOT PREPARE for Civil Service Examination? Teaching? Stenographer? Bookkeeper? Stationary Engineer? Electric Wiring? Electrical Engineer? Mechanical Engineer? Mechanical Draftsman? Electric Wiring? Matriculation. \$5. Tuition free. Mail course. Address Carnegie College, Rogers, Ohio.

GOVERNMENT POSITIONS offer steady, pleasant employment, big pay. Influence unnecessary. Get your preparation from former United States Civil Service Examiner. Write for big, free, descriptive booklet. Patterson Civil Service School, Box 826, Rochester, N. Y.

ALCA \$6.00 Hand Vacuum Cleaner wins first prize at all exhibitions, county fairs, etc. It is the finest agents' proposition in the land. Write for money-doubling contract. Alca Vacuum Cleaner Co., Dept. B, 366 West 50th St., New York.

YOUNG MEN who desire to become professional base ball players write at once giving experience. American Base Ball Registration Bureau, Dept. A, 409 Phoenix Bldg., Minneapolis, Minnesota.

BIG MONEY WRITING SONGS. Thousands of dollars for anyone who can write successful words or music. Past experience unnecessary. Send us your song poems, with or without music, or write for free particulars. Acceptance guaranteed if available. Washington only place to secure copyright. H. Kirkus Dugdale Co., Dept. 265, Washington, D. C.

WANTED—WANTED—WANTED—Railway Mail Clerks, \$800 to \$1,600. Examinations coming everywhere. Common education sufficient. Coaching free. Write immediately. Franklin Institute, Dept. O-21, Rochester, N. Y.

"YOUNG MEN WANTED" as Chauffeurs, good positions open for trained men, paying \$25 to \$50 weekly. I teach you all about the Automobile in 10 lessons at home. Lessons are simple, practical, and interesting. Free model to each student. Complete course, \$5. Sample lesson free. Write today. F. Halls, 45 W. 34 St., New York.

HOLIDAY MONEY.—a beautiful Silver Mesh Bag and presents for men and women for your help. We want your friends to see the Gift Book, our catalog of inexpensive gifts. With it you can earn enough to buy all your presents, or get them free. Be first to write from your town. Dept. A, American Manufacturers Co., 3rd Floor, Tribune Bldg., N. Y.

DANDY HOME BUSINESS. Collect names, information, etc., for business concerns. Steady income. Fascinating work. Instructive booklet for stamp. Information System, 261, Marietta, Ohio.

LEARN VENTRILOQUISM—A source of unlimited fun. 64-page book containing complete instructions, 10c. A Crosby, Merrimac, Mass.

BECOME A DETECTIVE. Magnificent possibilities, correspondence lessons. Write Detective Wagner, 1243 Lexington Avenue, New York.

WANTED DISTRIBUTERS of advertising matter everywhere. Oliver D. Barkley, Mount Pleasant, Pennsylvania.

YOU ARE WANTED for government positions. \$80.00 month to commence. Annual vacations. Short hours. No "layoffs." Common education sufficient. Over 12,000 appointments coming. Influence unnecessary. Send postal immediately for free list and description of positions open. Franklin Institute, Dept. O-21 Rochester, N. Y.

LIVE AGENTS for mail box proposition; \$10.00 daily. Moore, Barree, Pa.

WANTED—RAILWAY MAIL CLERKS—City Carriers—Post-office Clerks. Average salary \$1,100. Examinations coming everywhere. Send immediately for free sample questions and schedule showing dates. Franklin Institute, Dept. O-21 Rochester, N. Y.

2,000 RAILWAY MAIL CLERKS WANTED, \$800 to \$1,600. Examinations everywhere. Preparation free. Franklin Institute, Dept. O-21 Rochester, N. Y.

WANTED ONE THOUSAND CHAUFFEURS and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$20.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1600 Michigan Ave., Chicago.

WANTED—ACTIVE MAN OR WOMAN, each locality. To join this society, and introduce our memberships. Sick, Accident, Death Benefits. All or spare time. \$50 to \$500 a month. Every member secured gives steady monthly income. Box GA-293, Covington, Ky.

WANTED SALESMEN to sell Gasoline Lighting Systems; no experience necessary; attractive proposition. Doud Lighting Co., 174 No. Sangamon St., Chicago, Ill.

WE TRAIN DETECTIVES. You can be one. Splendid opportunities. Travel. Earn \$100 to \$300 monthly. This fascinating profession taught practically and scientifically by mail at a nominal cost. American School of Criminology, Dept. F, Detroit, Mich.

WANTED, AGENTS, MACHINISTS, ATTENTION! Increase salary, new revised Saunders' Hand Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

STOP HERE! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

WANTED—A man or woman to act as our information reporter. All or spare time. No experience necessary. \$50 to \$300 per month. Nothing to sell. Send stamp for particulars. Sales Association, 601 Association Bldg., Indianapolis, Ind.

FLOUR & MILLING MACHINERY

SPECIAL BARGAINS IN SECOND HAND: Attrition Mills, Burr Mills, Crushers, Corn Shellers, Bran Dusters, Dust Collectors, Purifiers, Reels, Double, Single 2 and 3-pair High Roller Mills, Sieve Bolters, Receding Separators, Scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

FOR SALE—No. 4 Garvin milling machine with counter shaft \$75. H. T. Webster, 31 Linden St., Schenectady, N. Y.

MACHINERY AND TOOLS FOR SALE

REBUILT MOTORS—We have a number of second-hand marine engines of our own and other makes, completely rebuilt and guaranteed by us. As the builders of "Buffalos" are not in the second-hand engine business, we will sell them at less than factory cost to make room. This is a rare opportunity to get the highest grade of engines—2 to 100-hp.—cheap. Buffalo Gasoline Motor Co., 1284-96 Niagara St., Buffalo, N. Y.

BUILD YOUR OWN GASOLINE ENGINE from our castings and blue prints: 2 H. P. water cooled; 3 H. P. air cooled. 4 blue prints 12 in. by 18 in.—50c. A photo of either engine 10c, both 15c; prices or particulars free. If you make a purchase, will credit you. Vignean Machine & Mfg. Co., Box 9, 236 E. Jefferson Ave., Detroit, Mich.

FOR SALE, complete set of castings for 1/2 hp. stationary gasoline engine, also 3 hp. motor cycle engine set, and single and double cylinder Marine engine sets, Comet Motor Wks., 564 Jackson Blvd., Chicago.

FOR SALE—20 inch lathe, rebuilt, \$190; plain eng. lathe \$60; Miller \$135; planer \$185. Fifty other bargains. Bicknell M. & S. Co., Janesville, Wis.

DIRECT CONNECTED CENTRIFUGAL PUMP, 6 inch discharge, length of hose, elbows, flap valve, \$225. R. Pinner, 122 Water St., New York.

MODEL STEAM TURBINE—All parts (in rough) necessary to make a model Steam Turbine, and blue-print of same for \$1. Address Midget Machine Co., P. O. Box 214, Elizabeth, N. J.

FOR SALE—One 80-horsepower Ideal engine, first-class condition, at Tishomingo, Ok. Write P. T. Foley at Parsons, Kan., for price.

PUMPING ENGINE, 300 gallons capacity. Rider-Ericsson make, \$85. R. Pinner, 122 Water St., New York.

STATIONARY GAS ENGINE, like new, half price, 3 hp. Sage, 74 Congress, Detroit, Mich.

FOR SALE—One 5 ton belt driven refrigerating machine. Two 24-inch band saws. Geo. J. Adams, 39 South St., N. Y.

1 HP. HORIZONTAL steam engine, \$8. L. E. Howe, Liberty, Ind.

ROCK CRUSHER, 4x10 inches, \$125. R. Pinner, 122 Water St., New York.

TWO CYCLE, TWO CYLINDER, 4x3 1/2 inch Marine and Automobile Gasoline Engines. Castings and drawings of same for sale. Richards Iron Works, Manitowoc, Wis.

PULLEYS, GEARS, SPROCKETS, Shafting Hangers; see page 136. W. A. Jones Foundry & Machine Co., Chicago.

FOR SALE 25 brand new Goshen marine engines. Less than factory prices. Guaranteed. Jack Ihrig, Goshen, Ind.

WE BUY AND SELL Machinery, Pulleys, Belting, Shafting and Hangers. Fassman Bros., 30 So. Green St., Chicago.

UNIVERSAL MILLING MACHINE, index head, vise, \$390. R. Pinner, 122 Water St., New York.

FOR SALE—BARGAIN. One Erie City engine, 100 hp, side crank drive, good condition, can be seen running; also pulleys, couplings and shafting. Call or address New Rochelle Coal & Lumber Co., New Rochelle, N. Y.

TURRET LATHE, automatic chuck, 17 collets, capacity 1-9/16 inches, \$185. R. Pinner, 122 Water St., New York.

MID SEASON SALE of Auto and Marine Gasoline Engines, at cut prices. Write us your wants. Richards Iron Works, Manitowoc, Wis.

EIGHT HORSE gasoline Milwaukee engine on trucks. Pole sawing rig, two 26 inch saws, also drag saw machine. In good condition. Celester Beucus, Polar, Wis.

ELECTRIC MOTOR, 1/2 hp., two phase, 60 cycles, 110 volts, almost new, warranted perfect condition, cost \$55, sell for \$25. Dana Hull, Warren, Ohio.

FOR SALE—8 hp. stationary gasoline engine, reasonable. Box 347, St. Anne, Ill.

AGENTS can treble their money on my "Climax" device for men. Send 10 cents for sample. Climax, 56 Pemberton Sq., Boston, Mass.

SCREW CUTTING LATHE, 19 inch swing, 10 ft. bed, compound rest, hollow spindle, \$325. R. Pinner, 122 Water St., New York.

SAW BLADES, 10c dozen, 75c gross. Winship, 705 Masonic Temple, Chicago.

12 5-HP. STEAM ENGINES \$12 each. Lucas & Son, Bridgeport, Conn.

ONE AND ONE-HALF HORSE POWER air cooled gasoline engine, \$20. 25 volt, 30 ampere generator, \$30. Four new sixty portable storage batteries, \$5 each. D. F. Gammon, 11 Main St., Mitchellville, Iowa.

ENGINES, STEAM, GAS AND GASOLINE. 1-8 hp. (Finished or rough castings.) Electrical and Mechanical novelties, etc. See display ad, Page 138. Amateur Mechanics Supply Co.

FOR SALE—13"x6" Shepherd Screw Cutting Lathe, hollow spindle; \$85 for a quick cash sale. Western Machinery Co., Cincinnati, Ohio.

FOR SALE—Boilers, Engines, Pumps, Heaters, Gas Engines all sizes. D. Casey, Springfield, Ohio.

INTERESTED IN GASOLINE ENGINES? Send 50c for booklet, "How to Run and Install Gasoline Engines," and a year's subscription to Gas Energy, 28 Murray St., New York.

FOR SALE—Rebuilt; Throttling, Automatic and Corliss Engines, Boilers, Pumps, Heaters, Machine Tools, Tanks, Saw Mills, and general machinery, at bargain prices. Let us know your wants. The Randle Machinery Co., 1761 Powers St., Cincinnati, Ohio.

VERTICAL STEAM ENGINES, 2 to 25 hp. Send for circular. E. T. Frank & Son, 642 W. Pratt St., Baltimore, Md.

ENGINE CASTINGS, 1½ horse vertical gasoline, air-cooled. \$7. Three horse marine water-cooled, \$9 cash; drawings included; catalogue for stamp. Novelty Manufacturing Co., 852 West Sixth St., Cincinnati, Ohio.

FOR SALE—Gasoline Engines, automobiles, marine and stationary, also castings. Second hand ones taken in exchange and for sale. Apply with stamps. B. W. Richardson, R. No. 36, Peoria, Ill.

FOR SALE—Engine lathe, swings 9½ in., takes 25 in. between centers. Complete with full set change gears to cut all size threads, 3 to 40 in.; price only \$43.50. Address L. F. Grammes & Sons, Allentown, Pa.

LATHES—Send for free circular showing bargains on small Screw Cutting Engine Lathes. S. B. Machine Tool Co., Dept. L, South Bend, Ind.

PATTERN-MAKERS! A book devoted to the principles of pattern and core making and molding. Written by G. H. Willard, a practical pattern maker of years experience. This book, just published, treats the subject in a much more simple, direct and effective manner than most books along this line. 224 pages, 312 illustrations. Price \$1.00 postpaid. Popular Mechanics Book Dept., Chicago.

SERIES OF 7 LITHOGRAPHIC MODELS—Steamship, Automobile, Gas Engine, Steam Engine, Steam Turbine, Wireless Telegraph and Dynamo. Size 8x14 inches. All parts of these machines are shown and numbered to correspond to printed keys of names. Price each 50 cents postpaid or set of 7, \$3.00 postpaid. Popular Mechanics Book Dept., 318 W. Washington St., Chicago.

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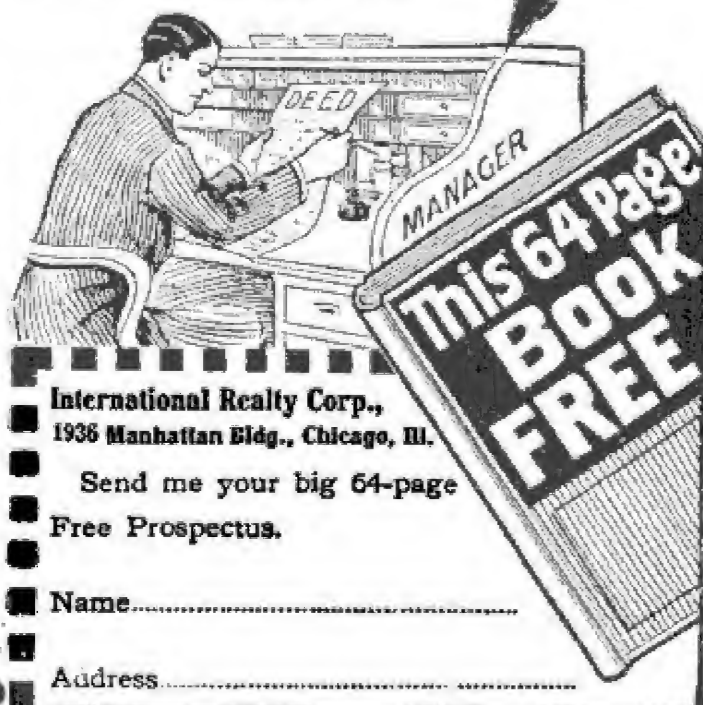
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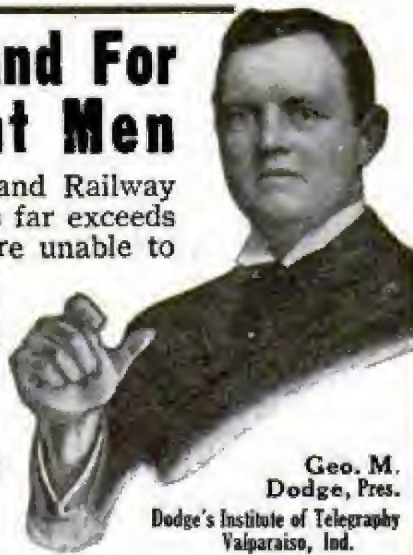
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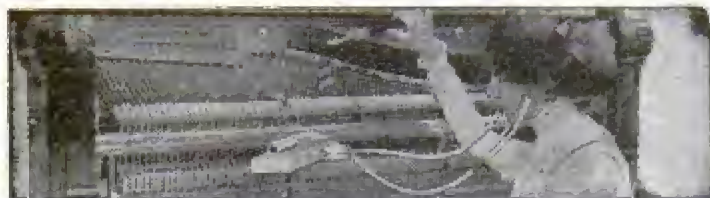
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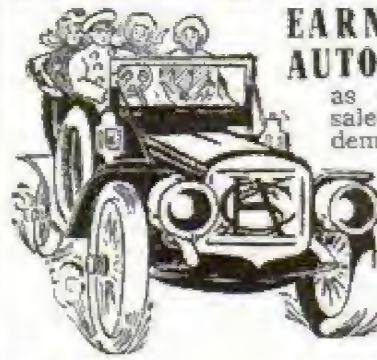
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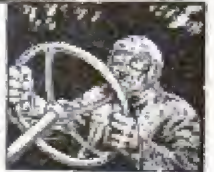
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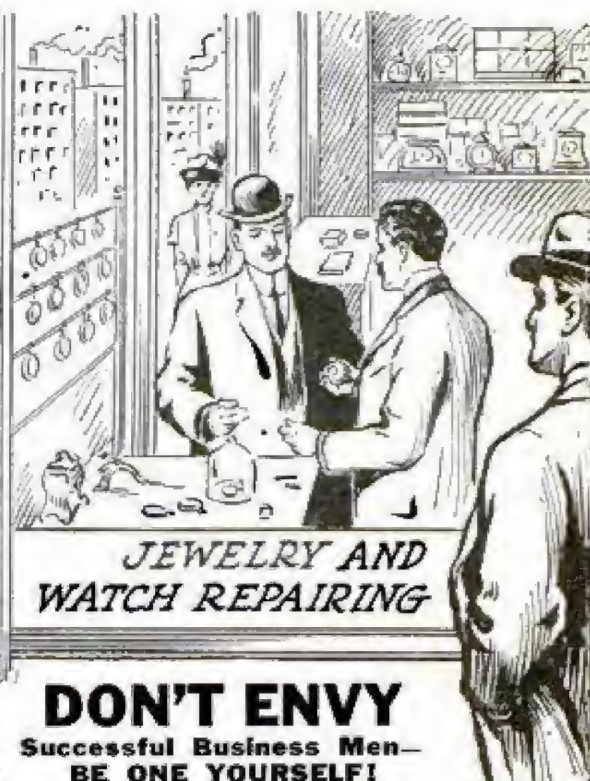
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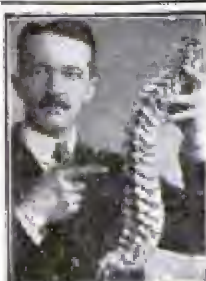
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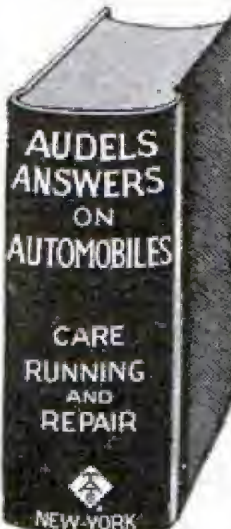


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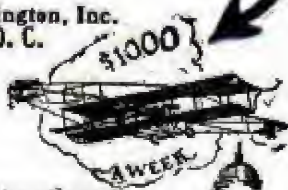
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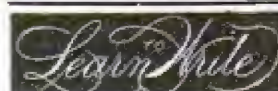
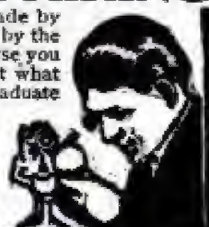
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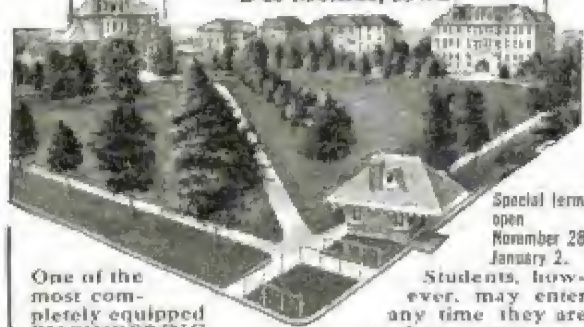
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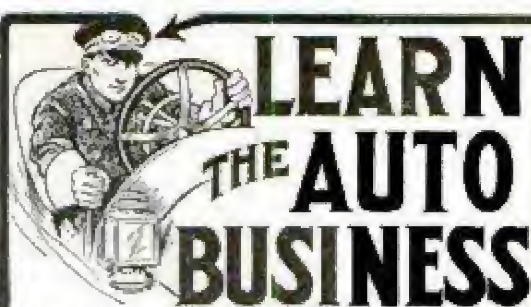
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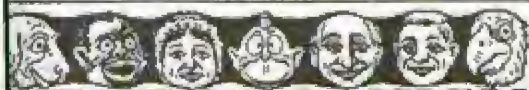
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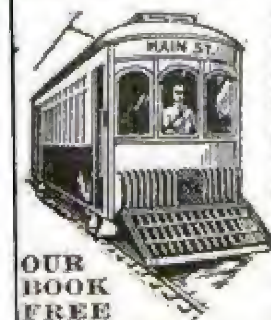
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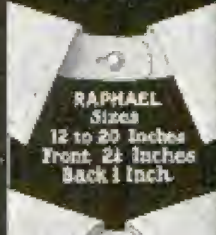
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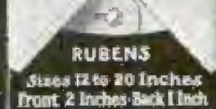
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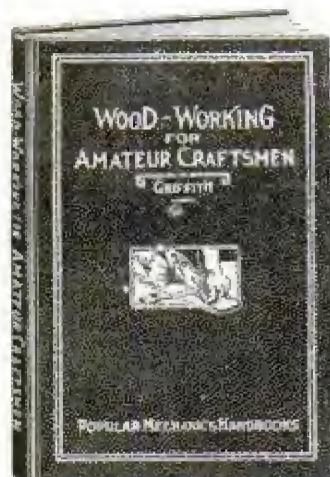
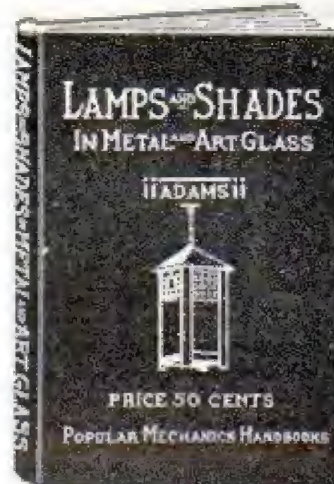
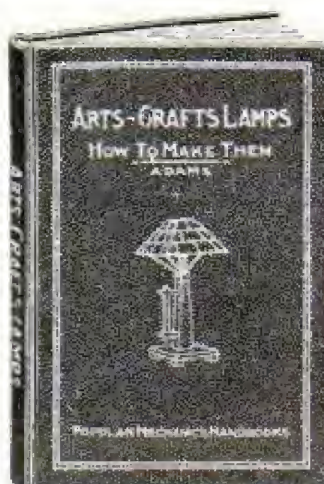
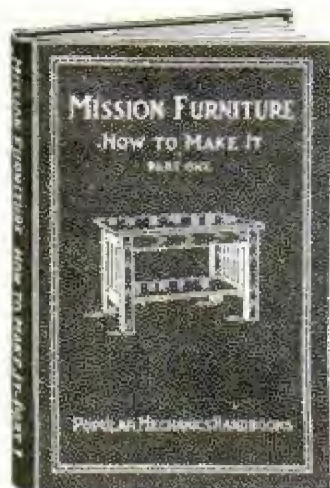
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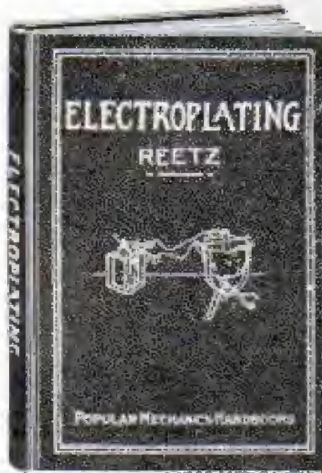
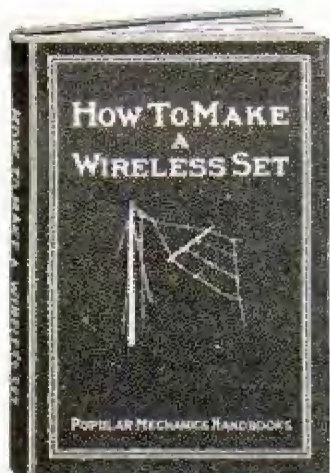
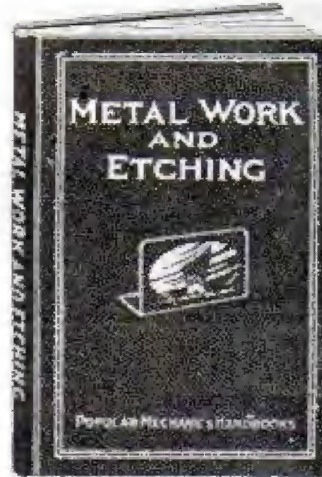
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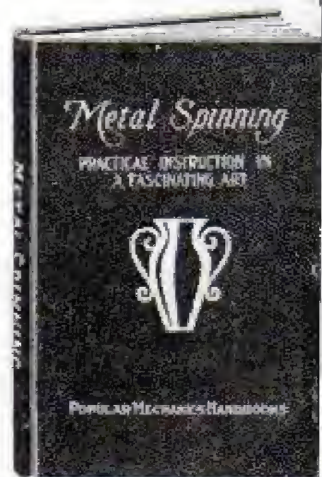
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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 16

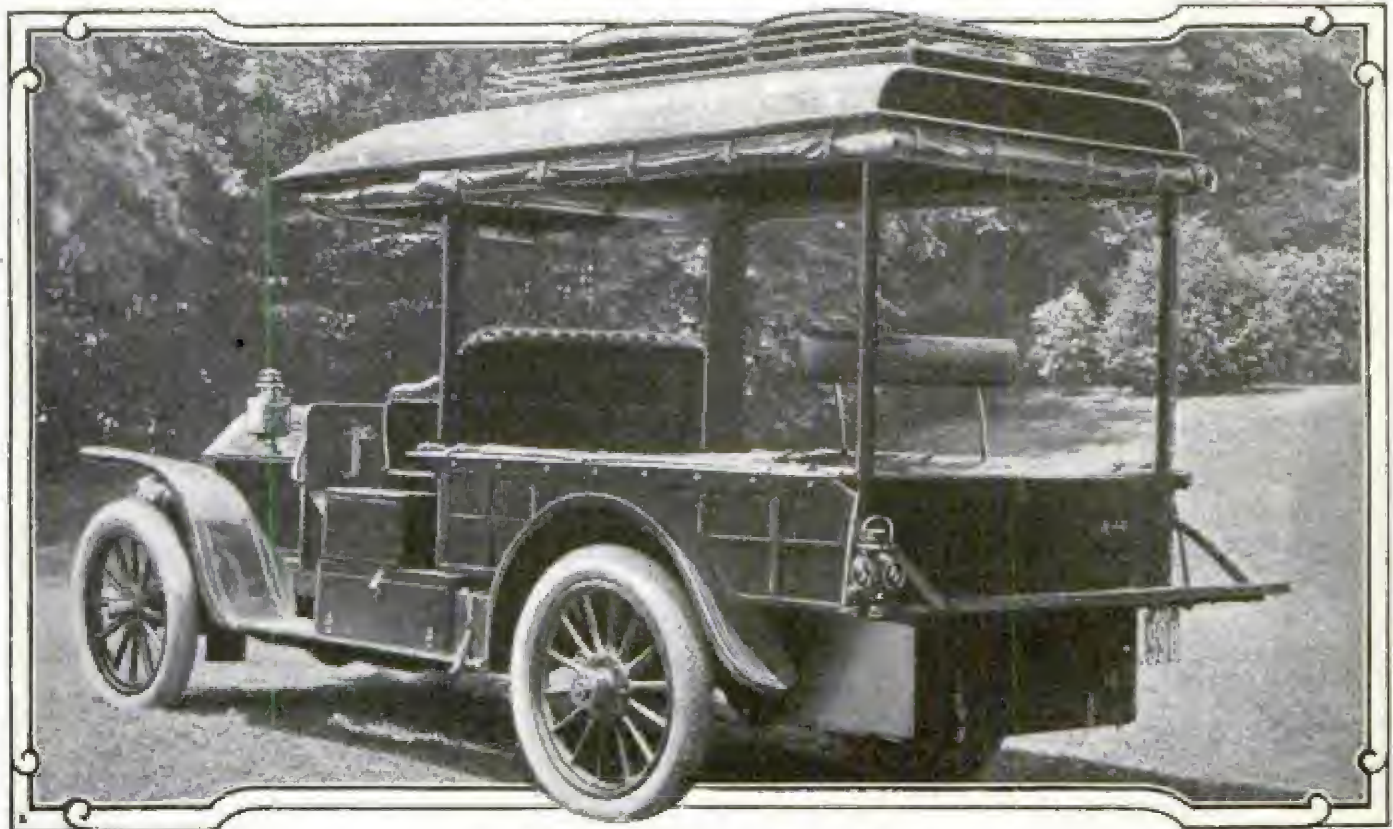
NOVEMBER, 1911

No. 5

An Ingenious Automobile-Camp Outfit



Senator Du Pont's Automobile Transformed into a Camp



The Same Machine in Running Trim

THE specially constructed automobile used by Col. Henry A. Du Pont, U. S. senator from Delaware, who is personally superintending the

public highway being built by him to run due north and south through his entire home state, is a masterpiece of ingenious construction. The car is

rated at 45 hp., and has a specially constructed body so arranged that there is sufficient length inside to accommodate a hair mattress 6 ft. long. Running the complete length of the body on each side are lockers affording storage place for supplies. The top is permanent, with a slat rack on the under side holding four vulcanized-fiber provision boxes. On top is an iron railing and a rack providing space for the carrying of four extra tires.

It is the tent arrangement, however, that is the most unique and ingenious. The material of the tent is waterproof balloon silk, which is light and can be packed in a small space. In making camp, the automobile occupies the center and the tenting is stretched out on both sides, six poles, three on a

side, each 6 ft. in height, being used to support the outer walls. Division curtains, dropped to the ground from each side of the automobile top, separate the camp into three compartments, the car-interior being the sleeping section. When the automobile is running the six poles are strapped alongside the body and the tent material is stored in one or two of eight boxes and lockers provided for storage. Two large storage boxes are carried in the center of the main body of the car, each having upholstered tops to serve as seats. They are clamped to the floor when the car is running, and are removed from the car when camp is made. One of these boxes is filled with bed clothing and the other carries a sheet-metal refrigerator and several metal trays.

COMBINED KITCHEN SINK AND BATHTUB

An exceptionally unique combination fixture for a kitchen is being marketed by an Ohio firm in the form of a combined sink and a bathtub. It is designed for performing the regular work of the kitchen and at the same time, as occasion requires, permitting of the room being used for bathing purposes in homes where space is an important requirement. Ordinarily the tub is

completely hidden by the sink, which is mounted on casters at its four corners, and, being open at the back, sets against the wall. When the bath is to be used, the entire sink is moved out of the way on its casters. The bathtub is permanently connected with the waste pipes and has, mounted at the waste end, a receptacle into which the waste from the sink flows to the trap which answers for both. Only one set of faucets are used.



An Unique Sink and Bathtub Arrangement for the Kitchen

NEW YORKER PLANS FENCE 150 FEET HIGH

A New York banker who feels that the privacy of his town residence has been invaded by the construction of apartment houses on adjacent property has filed plans with the building department of that city for a fence 150 ft. high. A 9-story apartment building is to be built on the lot west of the home of this banker, who is J. M. Francolini, and he figures that a fence 150 ft. high will be required to keep its future occupants from looking down upon him.

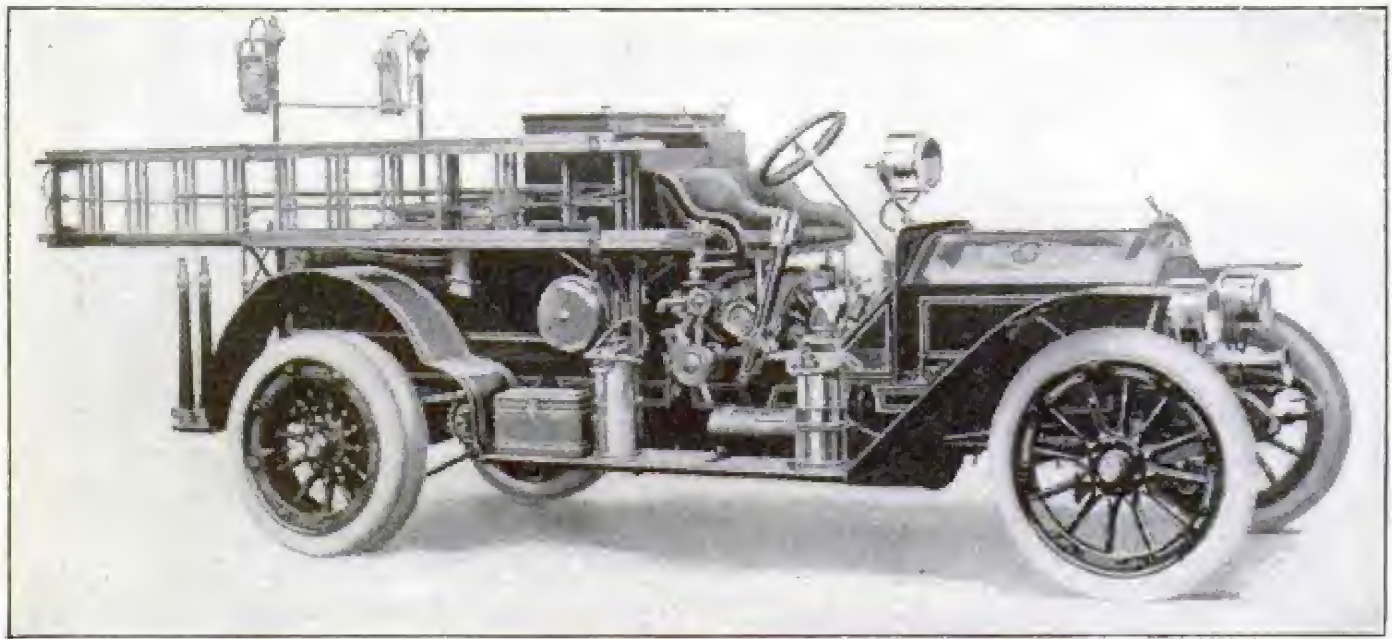


Upper and Lower Views Show Work of Laying the Keel of the "New York," the Newest Largest Battleship

Son of a Naval Officer Placing One of the Rivets in a Keel Plate



The keel for the "New York" was laid at the Brooklyn Navy Yard in September. The "New York" is to be a sister ship of the "Texas," now building at Newport News, and they will be the first of the big ships to carry 14-in. guns, their armament including 10 of these monsters. The two ships will be 95 ft., 2½ in. broad and 573 ft. long. They will each have a displacement of 27,000 tons.

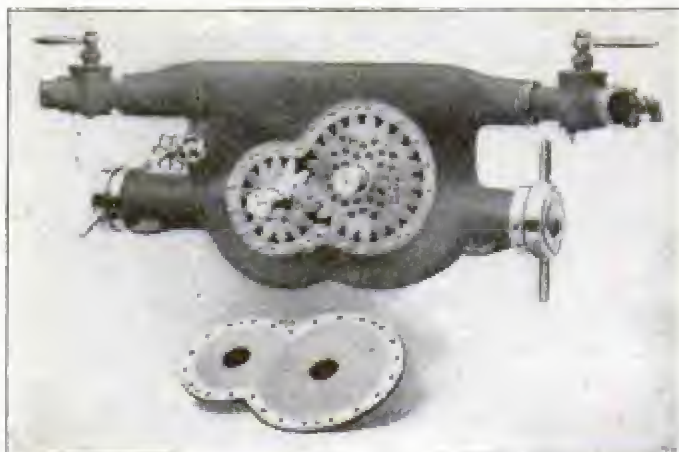


One of the Motor Fire Engines Equipped with the New Pump Which is Placed Under the Seat

POWERFUL FIRE ENGINE WITH GASOLINE PUMP

The development of the gasoline-driven pump for use in fire apparatus has recently been marked by the adoption of a rotary-gear system of operation in the engine turned out by one manufacturer of this sort of machinery. The pump is the result of years of experiments and is regarded as one of the simplest pieces of apparatus in the world. It is furnished in two sizes, which supply, respectively, 500 and 700 gal. of water per minute at a pressure of 60 lb. The pump consists simply of two gear wheels, their casings, and two outlet and two inlet valves. The entire pumping machinery is so small that it is placed beneath the seat of the driver without disturb-

ing the usual height of the seat in the least. There is an inlet and an outlet valve on each side. The power is supplied by the engine which also propels the vehicle on which the pump is carried. A lever operates a friction clutch just as an automobile clutch is operated, and the power can be switched from the propelling gears to the pump gears in an instant. The vehicle which carries the pump is also equipped as a hose wagon so that each engine can carry its own hose. The engine used is rated at 48 hp. and is sufficient to drive the vehicle at the rate of 65 miles an hour, this speed having actually been made over an ordinary road on an actual service call by one of the stock engines recently put into service in California. The new engine is supposed to be the highest development of the gasoline automobile fire apparatus with gasoline pump.

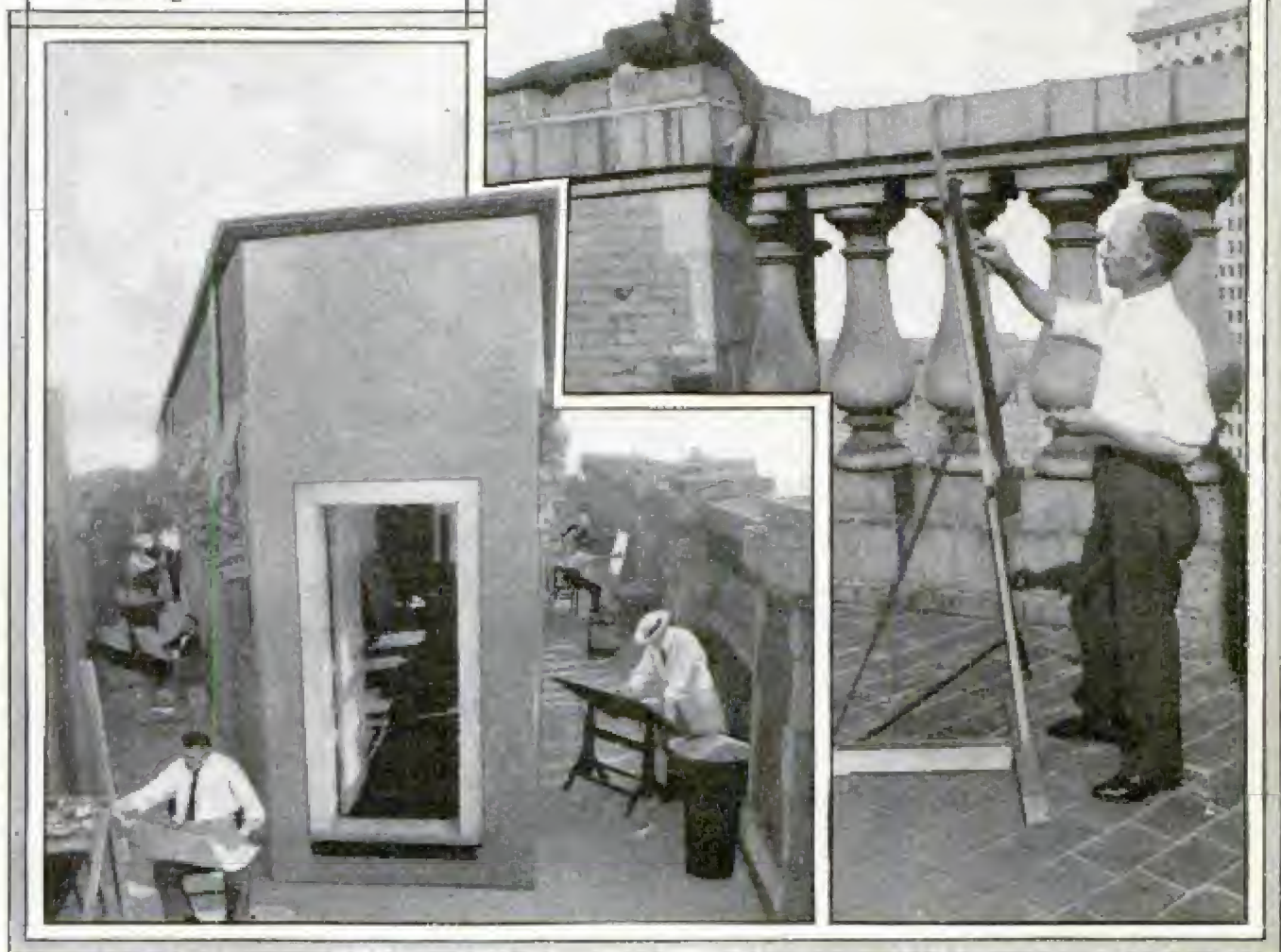


The New Rotary-Gear Gasoline Pump for Fire Apparatus

Wood is being seasoned in France by means of electricity. The timber is placed between two lead plates in a tank filled with a solution containing 10 per cent borax and 5 per cent resin. The current is said to drive out the sap and saturate the wood with borax and resin.



One of the Artists Making a Pen and Ink Sketch of Broadway; in the Distance is the Times Building



A General View of the Studios on Top of the Flatiron Building, Showing the Artists at Work in the Alleys on Either Side of the Studios

Sketching a Fireman in Action. The Model is Coming over the Roof Ledge of the Flatiron Building

NEW YORK'S UNIQUE ART COLONY

Ten of the best known illustrators and painters in the United States have their studios in common on the top of the Flatiron Building, at the corner of 23rd Street, Broadway and Fifth Avenue. This is 24 stories above the street level. The height is shown in one of the pictures by the Metropolitan Tower in the background. Here they pose their models on the balustrade around the top of the Flatiron, seemingly oblivious of the danger of dropping to the street hundreds of feet below.

ELECTRIC YACHT OPERATED BY WIRELESS

Boating parties on Lake Wannsee, which is located near Berlin, have been greatly startled on several occasions



A Yacht Which, Controlled and Operated by Wireless, Runs In and Out Among the Other Vessels on a German Lake without Having a Soul on Board

lately by the uncanny manner in which a new electric yacht called the "Frida" runs in and out among the other vessels, without a single soul on board to operate the engines or steer. She is operated and controlled entirely from a wireless station on shore, and is the first boat of her size so equipped.

FOUNTAIN RULING PEN

A convenient device for architects, draftsmen, and all who use ruling pens is this fountain attachment invented by a Californian. It consists of a small ink reservoir attached to the pen handle by a clip, and can be instantly detached if desired. A small metal tube leads the ink between the two points of the pen.



A Fountain Ruling Pen for Architects and Draftsmen

TO WARN AIRMEN OF THUNDERSTORMS

The Royal Prussian Aeronautical Observatory has instituted a service for the purpose of giving aviators warning of the approach of thunderstorms, which are especially dangerous for airships of the lighter-than-air type. The approach of a thunderstorm is always forecasted by the effect on telegraph apparatus, and in order that aviators contemplating flight may be informed of its probable course and extent, the Prussian postoffice department, which controls the telegraph system, has, at the request of the observatory, established 18 stations from which special information as to electrical disturbances will be communicated. The positions chosen for these stations are such that the observatory will be able to calculate the probable duration of a storm and the area over which it will extend.

TEMPERATURE HAS MUCH TO DO WITH CORROSION

In the course of an investigation of the corrosive action of salty solutions and sea water on iron and steel, two British scientists have discovered that the question of temperature is, in a measure, responsible for the contradictory results obtained by other investigators. From this investigation it seems that there is a connection between the water's corrosive action and its temperature, and that 39 deg. F. is the point of reversion. Above this temperature all salty solutions are less corrosive, and below it, more corrosive, than pure water.



Water Bird Caught while Casting for Fish



Landing the Water Bird after the Struggle

CATCHES WATER BIRD WITH CASTING BAIT

Anse Decker, a fisherman on Lake Hopatcong, N. J., recently made a remarkable catch in the form of a water bird locally known as a bulde gudgeon. He was casting with a patent bait near

some rocks when the water bird flew at the bait. One of the tail hooks caught it on the side of the mouth, and Decker reeled it in. After photographs were made the bird was released.

RUNAWAY ENGINE CRASHES THROUGH DEPOT

A runaway freight engine plunged into the passenger station at Lincoln, Nebraska, at the rate of 32 miles an hour recently, and was not stopped until parts of two brick walls had fallen on it and it had plowed its way half through the station building. The engine was started in some unknown manner in the freight yards and made straight for the depot, gathering speed as



The Locomotive after It Plowed through the Wall



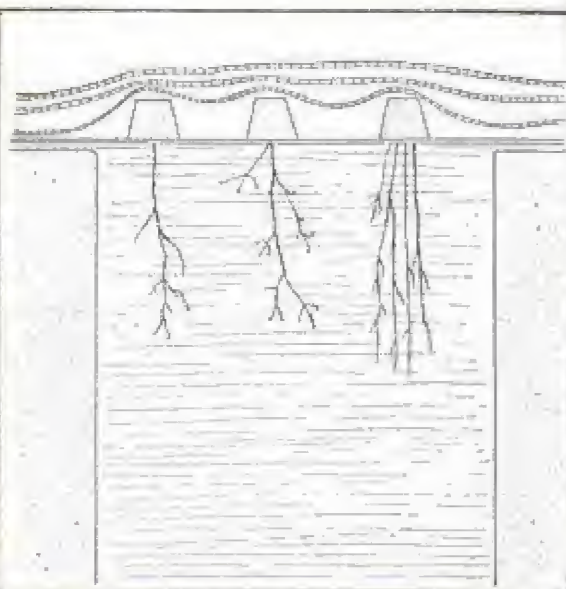
Only the Tender was Visible from the Exterior When the Locomotive Stopped

it went. The big locomotive ran through several switches and over two or three crossings before it struck the station, carrying away en route one of the bumper posts in the yards. No one was injured, although the depot building was almost completely wrecked.

Primitive iron furnaces found in Sweden are said to date back 2,000 years.



A Bathed and an Unbathed Flowering Plant



Inverted Plants in Hot-Water Bath

FORCING PLANT GROWTH BY HOT-WATER BATHS

In forcing hot-house plants the application of high temperature in the form of hot-water baths has been found by a German florist to be more effective than any other method. The hot-water bath is applied by inverting the pots over the receptacle in which the water is heated in such manner that the leaves and branches are immersed while the earth and roots remain dry. The inverted pots rest on slats placed across the top of the receptacle, as shown in the diagram.

The effectiveness of the hot-water bath is clearly demonstrated in two of the illustrations. The forked branch inserted in a bottle is a pussy-willow, one twig of which was given a hot-water bath. Eight or nine days after the bath the bathed twig was covered with catkins as in early spring, while there was no change in the other half. The other illustration shows a bathed and an unbathed syringa. The flowering plant was given a hot bath about the middle of November and was in full bloom at Christmas, while the other plant, which received the same treatment except for the bath, had not



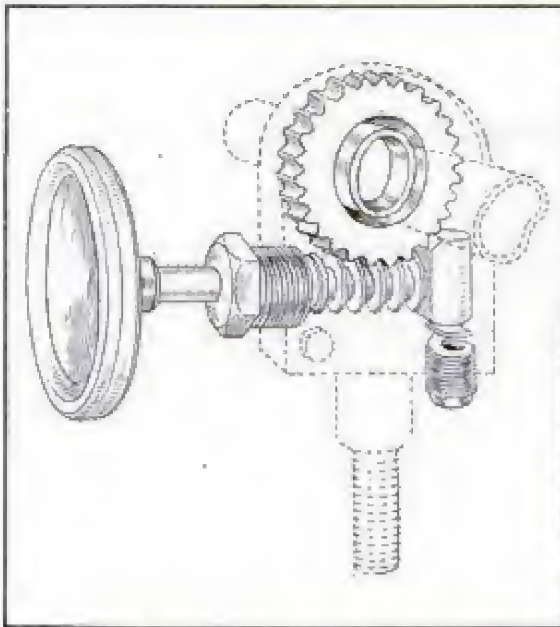
One of These Willow Twigs was Bathed

even started to flower. Matting or rugs are placed over the inverted pots to retain the heat during the bathing process.

X-RAY MOTION PICTURES

To combine the X-ray machine and the motion-picture camera so as to produce living X-ray pictures would seem to be difficult, yet two French scientists have actually produced motion pictures revealing the movement of the bones in the human hand and arm, and also the motions of the intestines.

The X-ray renders certain substances fluorescent, and the radiations emitted by the fluorescent substance are refracted by a condensing lens, thus making it possible to fix the X-ray image on a sensitized film. The main difficulty encountered was the finding of a substance emitting a fluorescent light which contained chemically active rays which would reduce the time of exposure to $1/32$ of a second or less, which is the maximum limit in motion-picture photography.



The Operating Mechanism



Changing the Angle of the Windshield while Driving

ADJUSTABLE WINDSHIELD FOR AUTOMOBILES

An exceptionally ingenious operating arrangement for automobile windshields has been brought out in England. The screen is arranged upon a swiveling bar which passes through and is keyed to a gear wheel set in a housing and operated by a worm wheel. By simply turning the small handwheel, mounted just in front of the driver, the angle of the shield is increased or decreased. The driver can easily operate it with the left hand while driving.

SMUGGLING CHINESE OVER THE BORDER

All along the border line between this country and Canada there is a constant battle of wits between the immigration men and men who make a business of smuggling Chinese into the country. Many methods are adopted to evade the vigilance of the government, some of which are ingenious and others more or less crude.

A recent method discovered in the capture of a smuggling band operating on one of the border rivers connecting the Great Lakes is shown in the illustration. In this instance the celestial was rowed out in a boat from the Canadian shore, helped into a barrel,

the open end of which was then closed up, and set adrift to float slowly across the line. Air was provided by means of a rubber tube, one end of which was



Floating a Chinaman across the Canadian Border Line in a Barrel

fastened to a float. When the barrel neared land it was picked up by confederates lying in wait along the shore.

¶The long prevalent belief that the surface of the planet Mars is covered with a net of intersecting straight lines, commonly referred to as canals, is now abandoned, says the *Cosmos*, by practically all astronomers. The enormously powerful telescopes of the present day dissolve these rectilinear canals into very irregular rows of more or less shaded spots.



This Dog Cheerfully Presents His Peg Leg in Shaking Hands

THIS DOG IS HAPPY WITH A PEG LEG

A fox terrier known as "Bob" to all the residents of South Vienna, Ohio, was recently run down by a motorcycle and lost his left forepaw. When the wound was sufficiently healed, the friends of the dog provided him with a leather stub, padded in the bottom with cotton, and held in place by leather straps. Now the dog runs about as happily as ever, and even offers the leather paw in shaking hands with his friends.

CITY STREETS INUNDATED BY MOLASSES

Battling with flood and disaster as borne on the crest of a wave of thick, sticky molasses that covers the sidewalks and roadways to the depth of a foot is brand new service for a fire department to be called upon to perform. The spectacle of 600,000 gal. of molasses tearing upon the street in the form of a raging torrent, carrying all before it, is something that would appear to be beyond even the imagination of the late Baron Munchausen. And yet that is exactly what happened within the course of a very few weeks in the city of New Orleans.

A storage vat that had formerly been one of the reservoirs used by the city water department, containing 600,000 gal. of molasses valued at \$40,000, collapsed and the entire mass of stuff flooded the streets a distance of two miles.

The reservoir was built of brick and concrete with wall and base 5 ft. through and surrounded by a 30-ft. mound of earth. So great was the flow of molasses as it rushed through the streets that two 15-ton boilers, which were lying near the reservoir, were lifted up and hurled across the street. The molasses was what is called black-strap molasses, a low grade, unrefined and used principally in the manufacture of whiskey, for stock feed, and general purposes.

It was the property of the Sugar Planters' Storage and Distributing Company, and no insurance covered loss of that peculiar character.

The molasses is said to have broken out with a loud roar and a city water main was broken by the flow. The reservoir in which the molasses was stored had not been in use for some years and about six weeks previous to the breaking of the reservoir the plant was leased for storing molasses. Before the molasses was placed in the tanks the plant was inspected by engineers and declared safe. However, the reservoirs were 60 years old and a weak spot was probably overlooked. As soon as the break was known a squad of policemen was sent to the scene and the fire plugs in the vicinity were turned on to wash the molasses into the drains.

HYDRAULICALLY COMPRESSED AIR LOSES OXYGEN

It has been found, according to the French magazine "Cosmos," that air compressed hydraulically contains only 17.7 per cent of oxygen as against the 21 per cent of the ordinary atmosphere. This difference, which is nearly one-fifth, is said to be partly responsible for the ills to which caisson workers are subject.



The Reservoir Which Broke and Flooded New Orleans Streets with 600,000 Gallons of Molasses. Boiler on Right was Thrown Across the Street by the Torrent of Sweetness



Sweeping Molasses Off the Sidewalk



Market Street after the Wave of Molasses Had Passed On Leaving Roadway and Sidewalks a Succession of Sticky Puddles

NEW COTTON GIN REMOVES ALL LINT

Almost since the cotton gin was invented by Eli Whitney inventors have been endeavoring to construct a gin



that would completely remove all lint from the cottonseed. A gin, which a New Orleans inventor declares will do this has just been patented. The machine under a recent test delinted every particle of the fiber from the seed and left the seed as clean as a pea. No saws, emory or carbon-dum are em-

ployed in the machine, but a new principle, the use of cold air, is a feature of the gin. The delinter stands 5 ft. in height and is 3 ft. in diameter. It can be constructed for \$200 to \$250 and operated with one horsepower, giving a capacity of 5 tons of cottonseed ginned in 10 hours. It is equipped with an automatic feeding device and a perforated cylinder with burrs bearing teeth similar to an ordinary grater. It also has a steel cylinder with perforated slots, through which the lint passes when removed from the seed. The lint is instantaneously carried to an outer air chamber where it communicates with a draft of cold air from an air pump in the gin. It is then blown through a chute. Inside the gin is a perforated casing fitted with a special steel comb, the teeth of which remove the fiber surrounding the seed.

The inventor declares that his gin will delint 200 lb. of lint more to the ton of cottonseed than any other gin known. It is predicted that when the machine comes into general use the

throwing of cottonseed with the valuable cotton fiber on it to cows for feed will become a thing of the past. In cottonseed oil mills, two machines are used to handle the seed before the oil is extracted. One is known as a cracker, to crack the seed, and the other a separator to separate the lint from the cracked seed. The new gin will do away with both of these.

Another claim made for the machine is that there will be a saving in seed for the planter in planting his crop. It is claimed that the seed, entirely free from lint, can be planted like corn, using a drill or similar apparatus. Still another claim made is that the clean cottonseed can be readily exported. At present it is difficult to export cottonseed as there is so much lint remaining on the seed that it is highly combustible.

BRITISH MOTORCYCLE FIELD ARTILLERY

The cycle and motorcycle section of the British Territorials, which is a branch of England's military strength similar to the state militia of this country, is expected to play an important part if England is ever threatened with invasion. The weapon mounted on a platform above the two front wheels of the motorcycle is a Maxim rapid-firing gun.



Member of the Maxim Gun Corps of Great Britain's Motorcycle Soldiers



Fortune Hunters of the Air Lanes

By VICTOR LOUGHEED

IT is one of the idiosyncrasies of the human mind that the golden age of romance must be always of either the future or the past; the present, lacking the glamor-investing perspective of time, being ever the commonplace.

Few there are whose blood is so cold or imagination so dead that they cannot thrill to the stories of the great pioneers—to the tales of those who have navigated the strange seas, discovered the new countries, settled the wildernesses, and perchance won wealth and wrung fame from the mines and on the frontiers of civilization. Likewise do the men who have adventured to the outposts of engineering achievement—the great inventors who have carried the flaming torch-lights of material advancement into the abysmal darkness of ignorance—in the fulness of time loom epic figures through the pages of history.

But as men are not heroes to their valets, neither are they geniuses to their contemporaries, wherefore the achievements being piled upon achievements by the men who are developing the flying machine are still matters for much skepticism and more jesting on the part of those who cannot understand. And yet in the stories of the airmen who have won fame and fortune, risked life, and suffered death, there is romance that rivals, as it comes to be told, the rarest tales of the vanished past, and the most fanciful imaginings of the elusive future.

Consider, for example, the plain story of an automobile-lamp manufacturer of France, who early commenced devoting his high engineering talents and the entire proceeds from a lucrative business to an unremitting pursuit of the problems of flight. Con-

structing machine after machine without success, and thereafter with only the most indifferent success, he arose on a July morning in 1909, at Calais, France, faced with ruin and all but crushed with criticism. He even owed a hotel bill that he absolutely had not the money to meet, and it seemed a matter of no more than days when his business must pass into the hands of his creditors. As a companion to mental misery, he was enduring the physical suffering from a foot so badly hurt in an experiment a few days before that he could scarcely bear his weight on it.

But in a shed at Baraques, a few miles along the coast, was a strange structure of wood and wire and fabric, mounting a crude air-cooled motor of a type that no man before or since has been able to run more than a fraction of an hour without overheating to inoperativeness. These were the cast and the properties for the drama; the stage was the 22 miles of the English Channel, a mist-overhung strip of silver that had maintained the insularity of England throughout all recorded time, that had kept Britain the mistress of the seas for centuries upon centuries, and that had even formed the one continuing and insurmountable barrier to baffle the boundless ambition and the almost superhuman power of achievement of the great Napoleon.

The engine was cranked by a pull on the propeller, and the crude craft fared forth on a voyage fraught with far more dreadful and unknown dangers than beset the famous Genoese navigator when he set sail from Palos with his three fate-defying caravels. Thirty-seven minutes later, with a sputtering, dying motor, the aeroplane



*Blériot made . . .
Auto Lamps*

a few have since successfully essayed flight and where millions will follow. Two hundred duplicates of the machine were ordered within the next six weeks, and today the business in Blériot monoplanes is one to make millionaire corporations envious.

Then there is the youthful mechanic who in the early summer of 1909 was working for something over a dollar a day in a machine shop in a little French town. A competition of flying models was held, and to encourage the entrants, a French army officer who was one of the great pioneers in flight investigation, offered as a prize a motorless Voisin biplane of the original model.

Thus Louis Paulhan came into possession of a discarded experiment of the lamented Captain Ferber, and after many tribulations succeeded in borrowing, for a few days, a motor from another army officer. With this aeroplane he laid the foundation for later triumphs. He flew a mile and a quarter



*Paulhan was . . .
a Machinist*

floundered brokenly to earth on English soil and a weary hero climbed out of it with his name recorded forever as the first to triumph where



*Latham was a . . .
conductor in Paris*

the first time he sat in the machine, on July 10, 1909. Within a week he was one of the first men in the world to have flown for an hour, and soon

after he had succeeded in annexing nearly all of the world's records. Six months later he had accumulated some \$50,000 by flight exhibitions in the United States and elsewhere, and before the end of another six months he had another \$50,000, made by winning the London Daily Mail prize for a flight from London to Manchester. Today Paulhan is one of the foremost aeroplane builders of Europe.

Another man to defy the fates was a builder of boat motors in France. Encouraged by some small successes with light-weight engines of a novel type, and possessed of opinions concerning aeroplane prospects, he emptied his pocketbook and squandered his bank account in the building of a number of machines, in the design of which the

previously mentioned Captain Ferber participated. The net result was a group of beautiful-appearing aeroplanes that their builder was unable to fly, he being fairly well on in both years and avoirdupois. At this crisis came along an ascetic and exceedingly good-looking youth, who had formerly served as a street-car conductor, and who, fortified

by a comforting philosophy derived from the fact that eminent medical opinion accorded him at the most a few months within which to die from tuberculosis, felt that he had little to lose by adding to his ailments the flying fever. Thus commenced the exploitation, by Levavasseur the engineer, and Latham the aviator, of the famous Antoinette monoplanes. And either the doctors were wrong, or aviation is less unhealthful than is popularly supposed, in that Hubert Latham is still alive and well after having flown more miles and won more prize money than any other aviator in the world.

An especially wonderful story is that of the two brothers who ran a bicycle shop in a small American city, and who were attracted to the study of flight

problems by accounts of interesting work done by European pioneers. The first to realize the possibilities of the developing automobile power plant as a means to the solution of flight problems, they first did a few year's preliminary work in the way of correcting and supplementing the conclusions of their predecessors. Then, in so matter-of-fact a way that the achievement was doubted for months after they had rendered it commonplace, they made themselves the first men in the world to get off the ground with a man-carrying power-driven machine of continued flight capabilities. And today, considered by many to be possessed of a prestige second to none in this field of engineering, the Wright brothers are among the world's foremost manufacturers of flying machines, and are popularly reputed to be worth close to a million dollars.

Another American to achieve fame and fortune by the air route was a small motorcycle manufacturer in New York state. Little was known of him, except as the builder and rider of a phenomenally speedy two-wheeler that one winter's day showed its rear number plate to the fastest automobiles in the world on famous Ormond Beach, until he found a place with kindred spirits in the historic Aerial Experiment Association. The quick result was the first successful public flying in America, followed first by the winning of a few classic aviation prizes, including the first Gordon-Bennett Cup abroad and then the Albany-New York flight of last year, and later an amount of profitable exhibition flying that has made the name of Curtiss a household word in 46 states.

Another case of tendencies that ran in the family was that of the three boys of French-English parentage who developed from indifferent European bicycle racers into indifferent automo-

bile racers. Beyond occasional wins of less important events, little was heard of them until one saw his opportunity in the aviation field, and soon passed from mediocrity to fame. Associating himself with early French experimenters he became the first in the world to fly in public a circular kilometer. The full history of the progress that has resulted from this beginning would occupy pages instead of a paragraph, so it must suffice



Farman was a . . .
Bicycle Racer

to state that Henry Farman is regarded as one of the most competent flight engineers in Europe—as is no more than due to the man who first devised the combination of wheels and skids in an aeroplane landing gear, and who is builder of a machine that in record-breaking performances and ability to earn prize money has demonstrated the most

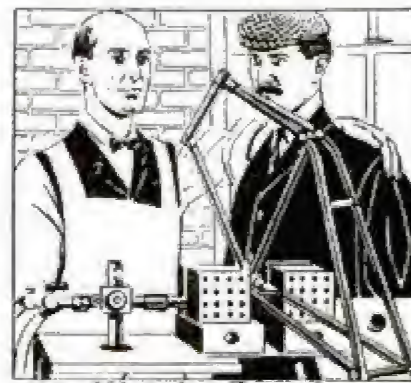


Curtiss was a . . .
Motorcycle racer

advanced qualities and received the plaudits of the most conservative promoters of the science.

Less known, but far from the least prosperous of the fortune hunters of the air lanes are the two engineers whose first serious interest in flight was founded upon the discerning opinion

that the motor problem, for the time being, at any rate, was the crux of the flight problem. Of a famous French family of engineers and chemists, de-



The Wright Brothers
made bicycles . . .

scended from an ancestor who built one of the earliest Montgolfier balloons, and possessed of abundant means, it is not hard to understand how this combination of the Gallic temperament with perhaps an inherited enthusiasm led to the expenditure of \$140,000 on what the wisest of critics denounced as a freak construction, before there was anything in hand that would revolve a propeller. But today it is universally recognized that the one unfailing way to fly is to own a Gnome motor, and last year the Gnome motor company paid to the two Seguin brothers, who own its \$240,000 of stock, over \$400,000 in dividends.

Less well-established perhaps, than the foregoing, but not less ambitious or capable, among the crusaders and knight errantry of the air, are a host of other names deserving of mention. Thus there are, for example, Védrières, who won \$20,000 for the famous recent flight from Paris to Madrid; Lieutenant Conneau, who won the Paris-Rome and the Circuit-of-Britain

flights within a single month; and the Voisin brothers, who were among the first and who are still among the foremost of aeroplane builders.

Nor are there ever to be forgotten the less-rewarded pioneers of a remoter era—the martyrs who toiled through the dangerous jungles of early ignorance to fall like brave soldiers at the ends of the trails they had blazed; and the builders of the solid foundations upon which was to be upreared an edifice that it was not given them to complete or see. Penaud, the French builder of models; Lilienthal, the German engineer; Pilcher, the Englishman; Langley, the American scientist; Chanute, the famous bridge builder and railway engineer; and Montgomery and Maxim, who, though pioneers, still live and are active—how replete are the very names with tales of the triumphs and the tragedies of invention, with the romance of the men who do and die while a light-hearted world looks on with laughs and jeers until it understands, and then makes amends, too late.

GUINEA PIGS AS LAWNMOWERS



These Guinea Pigs Keep the Lawn in Fine Trim through Feeding Upon the Weeds and Grass

The owner of these guinea pigs utilizes the feeding propensities of his pets to keep his lawn in fine trim. They are penned in a large wire-fenced inclosure which is moved from place to place over the lawn as the guinea pigs feed. These animals first devour the broad-leaved weeds and then proceed to clip the grass to the shortest possible length, severing all coarse stems and causing a velvety covering of tender young grass to spring up.

BREAKFAST FOOD FED TO LOCOMOTIVE

The Salt Lake, Los Angeles, and San Pedro Railroad Co. recently received a bill for several pounds of breakfast food purchased by a locomotive engineer at Nipton, Cal., for a unique purpose. A few weeks before the receipt of the

bill one of the road's fastest trains was stranded, because of a leaky locomotive flue, at Nipton, which is a desert station in southern California. Nothing could be obtained to stop the leak until the engineer finally thought of breakfast food, this material being suggested to him by the restaurant sign near by. The flaky material was mixed with scraps of paper and with water, the whole being kneaded into a tough paste, which was used to plug the hole. The train was thus enabled to reach a station where more substantial repairs could be made.

INSTANTANEOUS COFFEE HEATER

Assuming that coffee loses its aroma and flavor if kept hot for any length of time, a restaurant keeper in this country has invented a coffee heater by means of which the coffee served to each customer is heated just before serving. It is not, of course, practical to make fresh coffee for each customer, but in this heater the coffee is allowed to cool soon after being made and is not heated again until it is to be used. When coffee is ordered a cupful is run into a glass, and immediately made hot by passing a jet of steam through it.



A Restaurant Coffee Device by Means of Which the Coffee is Not Heated until Ordered, and Then Only a Cup at a Time



Bricklayers on New Safety Scaffold at Work on the Top Floor of a Skyscraper

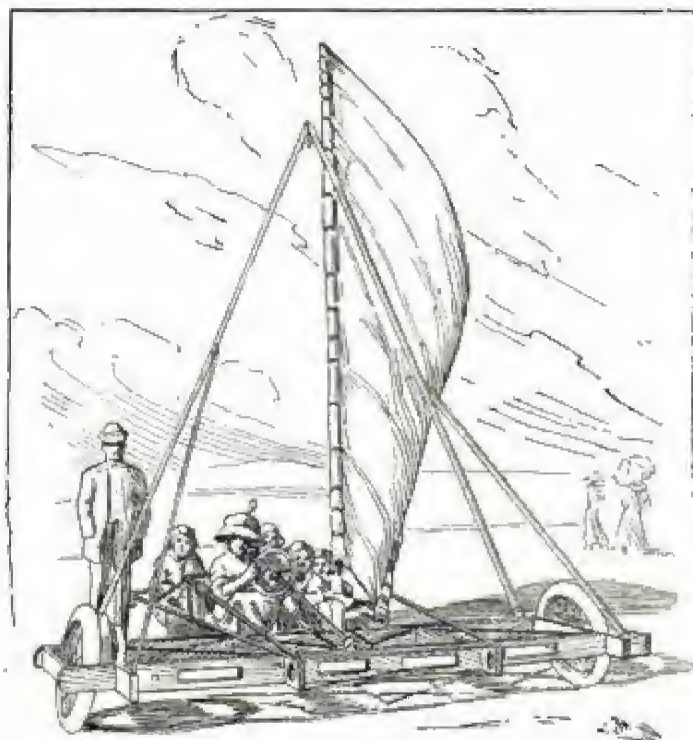
CORK VARNISH FOR SHIP INTERIORS

In order to protect the interior of steel ships from the humidity caused by condensation upon the metallic walls during sudden changes of temperature, the Italian government is experimenting with a "cork varnish." Ground cork is consolidated by pressure with copal and litharge, and the resulting mixture with suitable liquids is applied to the walls like an ordinary coat of varnish. The tests are said to show that the cork varnish absorbs the watery vapor of the atmosphere to the extent of 1 oz. for each 30 sq. ft. of surface exposed.

¶ In moving the German battleship "Thüringen," which has a displacement of 22,000 tons and a draft of 27½ ft., down the shallow Weser River from Bremen it was necessary to reduce her draft 3½ ft. This was accomplished by means of pontoons, six of which were used.

BLERIOT BUILDS A SAND-SAILING CRAFT

M. Blériot, inventor of the monoplane which bears his name, and the first airman to fly the English Channel,



M. Blériot, Having Conquered the Air, Now Enjoys Sailing the Sands near His Home in Northern France

has built, for the amusement of himself and family, a strange-looking sailing craft. He calls it an "aeroplage" (shore aeroplane), and designed it for sailing the sandy beach near his home on the coast of northern France.

The framework is similar to that of an iceboat, but it has three wheels instead of runners. Its sail is of the lateen type, and, in a high wind, drives the strange sand craft along at 60 miles an hour. It can sail into the wind as well as run along with the wind behind it.

WHAT A MISPLACED COMMA CAN DO

Taking some figures from a French publication, but failing to change the comma appearing in it into a decimal point, according to American usage, caused a Chicago newspaper to state recently that the largest single platinum nugget weighs 7,837

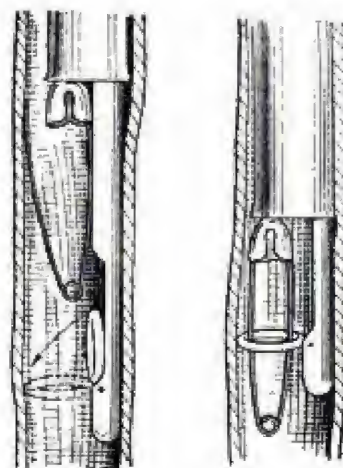
kilograms (15,674 lb.). The newspaper also stated that this great nugget was being kept in a collection of minerals belonging to Prince Demidoff, one of the two owners of the platinum mines in the Ural mountains, despite the great scarcity and increasing value of the metal.

The error of the statement is emphasized when one considers that the whole world's output of platinum in 1909, the latest period for which figures are available, was not more than 12,500 lb.; also by the fact that the value of such a nugget, which, if pure platinum, would occupy a space of nearly 15 cu. ft., at the present price is more than \$12,500,000, an amount even a wealthy prince would hardly allow to lie idle. The correct weight of the nugget is 7.837 kilograms, which is a little more than 15½ lb. In France 7,837 kilograms would be printed with a thin space between the two first figures.

EXTRACTING SAFETY PIN FROM THROAT

The accompanying illustration shows the operation of removing a safety pin from the throat by means of an instrument called the "endoscope." Its

construction is so simple that an explanation is hardly necessary, except that it should be mentioned that the pin-extracting device, which slides in the tube of the instrument, is only one



of the many accessories that may be used in connection with it. Among these accessories is an electromagnet for removing particles of iron, pincers for extracting bones, etc. By means of a suitable optical arrangement the surgeon has the object to be removed in full view during the operation.



Steamboat Composed of Apples in Sebastopol, Cal., Apple Show

STEAMBOAT MADE OF APPLES

One of the most interesting displays of the Gravenstein apple show, recently held at Sebastopol, Sonoma County, Cal., was a large replica of the steamboat "Gold", the framing being 20 ft. long and covered with Gravenstein apples. The sides of the vessel are white, produced by using sliced

evaporated apples. The smokestacks are composed of dried prunes, and the rigging consists of strings of small apples. The vessel rested in a tank of water, and the constant turning of the paddle-wheels and the movement of the walking-beam added materially to the attractiveness of the display.

ELECTRICITY IN THE AIR BLAMED FOR ILLS

A theory promulgated by a European physician, that there is altogether too much electricity of artificial generation for wireless purposes at large in the atmosphere, and that its presence is having a baneful effect on the human race, is discussed in American Medicine. The writer states:

"A new cause for toothache and certain nervous diseases has been found by a European physician in the high-tension electrical currents that are produced in the course of wireless telegraphy. This same savant is quoted as

predicting a general increase of nervous ailments traceable to this same cause. He believes that the neuronics elements are so affected that a low-grade neuritis is produced, which progresses according to each patient's general physical condition, hygienic surroundings, occupation, habits, etc.

"At first thought, this theory of atmospheric electricity exerting pathogenic action on the nerves or any other tissue seems unreasonable, but like many another new and original premise, the more it is considered the more

reasonable it becomes. The insidious effect of the X-ray on the skin and other tissues, the neuroses or neurotic tendencies frequently observed in those whose occupation forces them to spend considerable periods in rooms where powerful dynamos are constantly running, and the tropho-neurotic affections

so often encountered in physicians who use, day in and day out, the ultraviolet, high-tension, and other forms of electricity, are all more or less common, and lend color to the possibility that electricity has pathogenic as well as other properties about which practically nothing is known."



Rocking Rabbit

Wild African Elephant

Wooden Art Ostrich

Art Toys Designed by Famous Continental Artists and Painted True to Color

QUAINT TOYS DESIGNED BY FAMOUS ARTISTS

European lovers of the quaint and artistic in toys have given an enthusiastic welcome to a large collection of wooden art toys all of which were designed by famous continental artists who were invited to try their hand at this unique kind of work. Each bird and beast is true to scale and color. Included in the collection are ele-



Domestic Animals and Poultry as Well as Fish, Birds, and Wild Beasts are Caricatured by the Toy Artists

phants, lions and other wild animals, domestic animals, barnyard fowl and many specimens of the bird tribe, and even fishes.

ANOTHER PETROLEUM WASTE FOUND USEFUL

Chemistry has recently succeeded in almost completely eliminating the disagreeable odor from salts of naphtha acid, once thrown away as alkali waste from the refineries and long a nuisance in the petroleum industries. True, a certain amount of it has been used in the manufacture of soaps of the cheaper sorts, but the disagreeable smell had to be covered up by various expedients, such as the application of perfumes. Now, however, due to its being robbed of its stench, and the appreciation in the value of tallow which has brought about a rise in the value of oleic acid, it may become widely used in the cloth and textile industries. At the present time a large Baku textile house is successfully introducing naphtha acid in place of oleic acid.

CA new electric lamp with filament so closely wound as to resemble a gas mantle has been tried successfully in French lighthouses.



THE TRIPLANE "ASTRA"

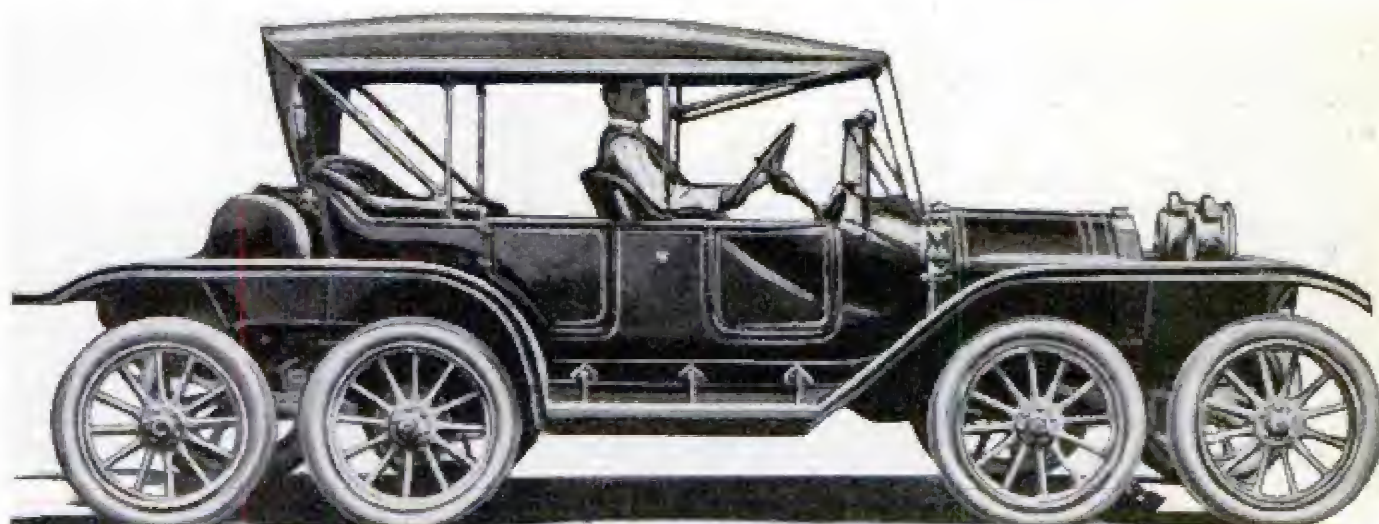
An aeroplane recently constructed in France. The framework is built of steel tubing and the body enclosed with metal sheeting. The heavy wheels are designed to minimize landing shocks.

EIGHT-WHEELED TOURING AUTOMOBILE

The unique eight-wheeled automobile shown in this illustration was built by a Columbus, Ind., manufacturer for experimental purposes. It has traveled extensively through the middle west and is claimed to be up to the inventor's expectations in riding qualities and minimization of tire wear. Easy riding is said to be due to the suspension of the car upon the groups of wheels at each end, so that but half or less than half the ordinary motion between body and axles is experienced.

Tire wear is claimed to be reduced by the distribution of the weight over eight instead of four tires. The first, second and fourth sets of wheels are steering wheels, the third set being only drivers.

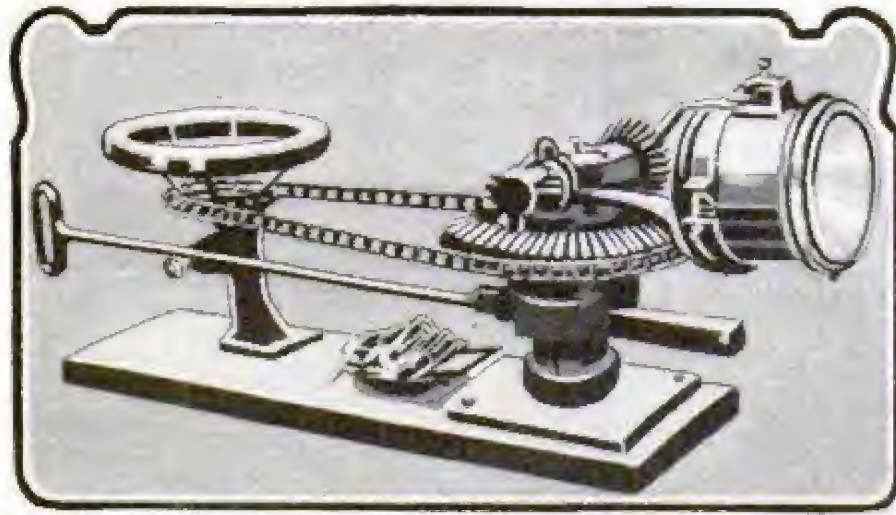
According to London publishers the recent decreased circulation of cheap literature in England is due to the opening of innumerable motion-picture theaters.



Experimental Auto with Eight Wheels Designed to Save Tires and Promote Comfort

SIGNALING HEADLIGHT FOR TRAINS

By means of the mechanism shown in the accompanying illustration, a twist of the wheel the headlight may be thrown right or left in a semicircle



A Movable Locomotive Headlight Which may be Used for Signaling as Well as for Lighting the Way Ahead

in front of the locomotive and along the plane of the tracks. The supplementary rod with the handhold is provided with an automatic stop pin which allows of the elevation of the light rays to the perpendicular or to any of the angles in the quarter circle, thus making possible a code of signals. There may be, for instance, a switch around a curve in a cut, at which point the engineer of one

Melrose Park, Ill., inventor expects to provide railroads with an electric locomotive headlight which can be used for signaling purposes as well as for illuminating the track ahead. By a

train expects to meet and pass another train. With such a signaling device, the engineer of the train on the siding could give the signal, "safe on siding, come on."

COLLAPSIBLE CORES FOR CONCRETE HOUSES

The walls of a concrete house recently completed in Washington, D. C., were constructed around collapsible

construction without the loss of nearly if not quite all the lumber used to form the inner molds.



Concrete House, the Walls of Which Were Built Around Collapsible Cores

In the Washington house the walls were made with an inner and an outer thickness of 3 in., with a 4-in. air space between. The collapsible cores are 3 ft. long by 1 ft. high, and narrower at the top than at the bottom, so that each completed section of wall carries a ledge on which the mold may be placed for the pouring of the next upper layer. The two sides of each mold are held apart by double wedge-shaped blocks at each end, and,

cores invented by the builder of the house. This core system makes possible a poured concrete wall of hollow

when two or more molds are placed end to end in the wall, the result is the formation of a diamond-shaped bond of

concrete, which holds the inner and outer walls together.

A novel use is made of the hollow wall space of this house. The heating plant is of the hot-air type, and the heated air is led through piping to the hollow wall spaces, where it is liberated and finds its way into the rooms through registers in the inner walls, thus doing away with the usual pipe conductors.

The method of pneumatic cutting adopted in Twelfth street, Brooklyn, for the sinking of a 4-ft. gas line, is shown in the accompanying illustration. Two chalk lines are marked on the surface and the chisels follow them exactly, the average cut per man being 20 ft. an hour. The cutting tools, running along the two lines defining the width of the trench, cut through the asphalt and turn it partly over as a



Courtesy Compressed Air

Cutting Out an Asphalt Pavement in Brooklyn with Pneumatic Hammers, the Slice So Cut Out Being Subsequently Broken Up with Crowbars and Sledges

CUTTING ASPHALT WITH PNEUMATIC HAMMERS

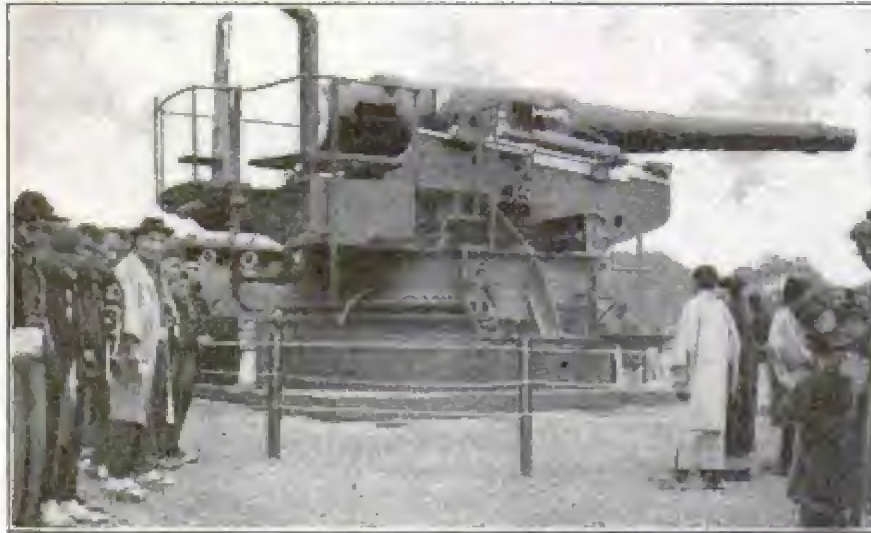
One of the latest uses for which the pneumatic hammer has been found highly serviceable is the cutting out of asphalt and macadam pavements for the laying of railway tracks or the sinking of pipe lines. The operation of breaking into an asphalt street pavement by the old methods is a strenuous task, and one which makes the following of any precise lines of cleavage difficult, but with the pneumatic hammer, the cut is sharp and definite.

plow turns earth. The sheet of asphalt is then being pried up by a crowbar gang, while one man breaks it with a sledge. The macadam foundation was cut in the same manner, but pointed picks were substituted for the chisels.

Power was provided by a portable air-compressor driven by a gasoline engine. A 2-in. iron pipe was laid on the surface of the pavement close to the curb and the pneumatic hammers were connected at various points by hose connections. This arrangement made unnecessary the frequent shifting of the compressor as the work progressed.

CAPTURED RUSSIAN GUN A WAR MONUMENT

One of the most unique memorials of a war is to be found in a public park in Tokyo. It is simply a modern siege gun mounted on a suitable base which bears mute witness to the pa-



Russian Siege Gun in Tokyo Park

triotism and sacrifice of the Japanese army. There is nothing on the stone pedestal but the gun. Its presence in a Japanese park, stamped as it is with Russian marks of identification, renders unnecessary any tablet or further mark to give it character as a memento of a grim and bloody conflict.

NEW ALPINE TUNNEL PROPOSED

Mont Cenis, which is already pierced by the oldest of the Alpine tunnels, will again be bored through, if plans worked out by Italian engineers are carried out. The new tunnel is planned to run in a northwesterly direction from the Italian side and will be 13 miles long. Its highest point will be 740 ft. lower than the old tunnel, and it will shorten the route between Turin and the French frontier station by about 12 miles. The estimated cost of the project is \$16,800,000, and the originator of the scheme claims that it will effect an annual saving in operating cost of \$640,000, due to the lesser grade.

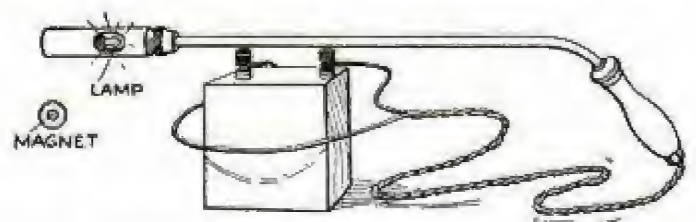
STRAW AS ROAD-MAKING MATERIAL

It is claimed that straw is proving remarkably practical as a road-making material on the extremely sandy roads in Mississippi County, Missouri. Its practicability was discovered some time ago by watermelon haulers, who were in the habit of drying up boggy places by throwing straw in them. These places soon became hard and firm, and last year an entire stretch of road was attempted. This also proved successful, and now about 50 miles of straw road is under construction.

The method of construction adopted is to cover the roads with wheat straw twice each year to a depth of about one foot. The straw is then covered with sand from the road, and soon becomes firmly embedded in it by the action of the passing traffic. According to reports, the mixture soon cements itself together so that a surface nearly as firm as a crushed-stone road is secured.

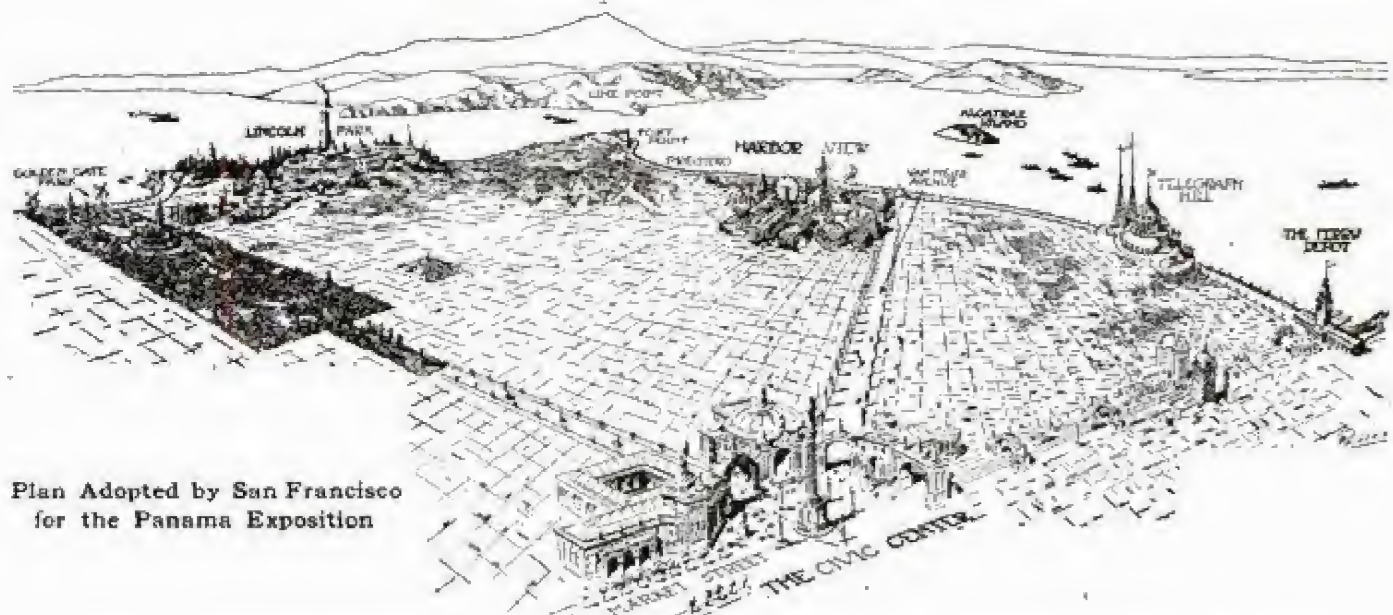
COMBINED ELECTROMAGNET AND TROUBLE LAMP

It is a usual experience, in overhauling an automobile, to drop small tools, nuts, screws, washers, etc., into awkward positions, but with this combined electromagnet and trouble lamp the



This Combined Trouble Lamp and Electromagnet is a Handy Device for Motorists

recovering is usually simple. The small lamp makes quick location possible, and the magnetic attraction is sufficient to lift out all small metal articles so lost.



Plan Adopted by San Francisco
for the Panama Exposition

TO TRANSFORM A CITY INTO A WORLD'S FAIR

In their effort to make the Panama Canal Exposition in 1915 the "biggest show on earth," the people of San Francisco have thrown their modesty to the winds and instead of placing the show in San Francisco they have put San Francisco in the show. That is just what the plans adopted for the exposition mean as the exposition buildings have been placed here and there throughout the city so that to visit them all, the guest within the city gates must traverse the entire municipal area. In other words San Francisco itself will be the Panama Exposition.

The plan that has been adopted is probably the most unique ever devised for an international show of any sort. It contemplates the inclusion of the better part of the city in the scheme of things so that Market Street will be a Boulevard of Industries, Van Ness Avenue a broad Midway Plaisance and the streets that intersect these two main thoroughfares from Telegraph Hill to Golden Gate Park will contribute their quota of gayety or instruction.

The North Shore with its Barbary Coast resorts will be transformed and a broad boulevard, that will follow the waterfront from the Ferry Building to Golden Gate Park, will bear permanent witness to the enterprise and public spirit of the men who are building the fair.

The decision as to the site for the exposition came after six months of debating the merits of rival situations. The decision was a compromise between preferred sites and yet the plan is so unique and original that everyone is pleased. The two main sites selected are Harbor View, a crescent on the shores of San Francisco Bay and lying almost midway between the Ferry building and the Golden Gate, and 540 acres in the west end of Golden Gate Park, which fronts on the Pacific Ocean below the famous Cliff House. In its course from the Harbor View site to the west end of Golden Gate Park the boulevard will pass through the United States military reservation at the Presidio, which will be improved by the government, and through Lincoln Park, an elevated knoll of 150 acres, which commands a sweeping view of the Golden Gate, San Francisco Bay, and the Pacific Ocean. Lincoln Park will also be part of the exposition grounds. There will be erected a heroic figure symbolic of California welcoming ships to the Golden Gate after the manner of the Statue of Liberty. Lincoln Park is the supreme observation point of the comprehensive exposition site and its contours are on an average from 200 to 300 ft. above sea level.

Along the course of the boulevard, between Lincoln and Golden Gate

parks, the temporary concessions, buildings of foreign nations, and like structures will be erected. Permanent buildings comprising an art gallery, a coliseum erected around an existing stadium, a replica of the Panama Canal connecting lagoons of different levels, and other structures, will be erected in Golden Gate Park.

The Harbor View site will be the marine site of the exposition. Vessels from foreign nations will anchor at this site and it will command a full view of all naval demonstrations. A huge yacht harbor will be among the features. Here will be located the amusement features of the exposition, such as the "Midway," the buildings devoted to the machinery and other heavy displays. The night life of the exposition will be located here.

Market Street, the main thoroughfare of the city, will be adorned with columns and arches giving a pergola effect, from the Ferry Building to its junction with Van Ness Avenue, a distance of almost two miles. At or near the junction of Market and Van Ness an architectural civic center is planned. Here will be erected a huge auditorium, theater and convention hall.

Thus anyone approaching the exposition by Market Street or Van Ness Avenue will pass through the heart of the business section of the city almost to the limits of the former burned district, and will then turn toward San Francisco Bay on Van Ness Avenue, finally reaching the marine site of the exposition at Harbor View.

Harbor View will be connected with Lincoln and Golden Gate parks by a railroad running through the Presidio. But apart from this, both Golden Gate and Lincoln parks are readily reached by street-car systems. Any part of the exposition site may be reached from the heart of San Francisco within 20 to 45 minutes.

Another project within the scope of the adornment of San Francisco will be the territory of Telegraph Hill, a lofty eminence overlooking San Francisco Bay and located on the course of the boulevard between the Ferry Building and the Harbor View site. On Telegraph Hill will be located an observation terrace and there will also be built there the tallest wireless tower that can be constructed, with the object of signaling vessels as they pass through the Panama Canal.

SWISS LOCOMOTIVES HAVE STACK LIDS

The Swiss railroad companies have devised a means of lessening the smoke and gas in the many tunnels along their lines that might be adopted by the American roads with much comfort to the passengers. The smokestacks

of the Swiss locomotives are all provided with lids and when the train enters a tunnel the lid is closed down and the steam exhausts beneath the locomotive, thus reducing the amount of

smoke, gas or steam that gets into the tunnel to a minimum. Except



during the progress of the trains through the longer tunnels no firing is done.

SUBMERGED FOREST FOUND IN RUSSIAN RIVER

While dredging the bed of a river recently in Russia the workers found a submerged forest of oak trees which extends over an area of several square miles. Trunks from 100 to 200 ft. long and 2 ft. and over in diameter have already been recovered. The wood is said to be extremely hard and of a rich and varied assortment of tints, from deep brown to pale rose, with intermediate shades of blue and yellow. The lumbermen in the vicinity estimate that this timber mine will yield at least 150,000 trunks.

COMMENT AND REVIEW

FIRE chiefs of the leading fire departments throughout the country held their annual convention recently in Milwaukee, and in passing let it be said they were an unusually impressive body of men. No one could look into the faces of the five hundred and more fire-fighters gathered from ocean to ocean, and not read the story of their profession. They had worked up through the ranks and been made chiefs because they possessed certain qualifications in larger measure than their comrades. Determination, action, fearlessness and responsibility, were written into those faces just as unmistakably as the sculptor carves an expression into marble. There were also flashes in which the sternness of command melted into a certain tenderness which proclaimed the Great Heart. One or more of these traits will be found in a gathering of military and naval officers, or doctors; but I do not believe that in any other representative body of Americans, and certainly of no other nationality, will be found such force of character woven into the face lines as those of our noble Fire Chiefs.

Fire Chiefs' Faces



WHAT I started out to emphasize was the unanimous opinion at this convention that the fire-department horse must pass, even though with the substitution of motor for muscle there will be removed one of the brightest pictures in the memory gallery of the small boy. The daily "hitch up" at noon, or night, will no longer attract a gaping crowd of Young Americans, for the gasoline engine does not get out of practice, and nothing could be more unromantic than cranking one into action. At the convention were 37 pieces of motor-driven apparatus the largest of which was of 200 horsepower and weighed 10 tons. The new motor machines, engines, hose wagons, ladder trucks and standpipes cost more than the same equipment and their complement of horses, but the saving in "keep" will more than pay the interest on the first cost. The transition will occupy several years, but it is bound to come. One exhibit showed a 4-wheel hose wagon, motor driven, drawing a big steam fire engine minus its horses, the only alteration being a hook at the end of the steamer pole to connect the two. The speed with which this hose-wagon fire-engine outfit traveled streets and turned corners was an unmistakable demonstration of the superiority of the new over the old method of propulsion.

Motor Fire Engines



PERHAPS in no other nationality does the business instinct so generally exist among its women, as the German. The number of German wives, who can or do assist their husbands is by no means confined to occupations chiefly manual. No other country considers so seriously the necessity for long, careful training of its young men as does Germany. Three years of study or training does not seem long there; even waiters in restaurants serve that term before they are considered really competent. Now comes a leading German champion of woman's rights who advocates compulsory domestic service for girls and young

Compulsory Training of Housekeepers

women, the training to be as thorough as the military service of the young men. Mrs. Woerner, author of the plan, anticipates objection with the statement that the same argument was once raised against compulsory military service, but that the resulting enormous benefit to German manhood has brought general approval of the system, and would work out the same way in the proposed domestic training.



THERE is just one really essential thing in which we Americans are far behind Europe, and that is our city paving and country highways: There you have to search for a poor road, while here, outside of a few states, one must

*Government
and
Good Roads*

buy guide books and hunt for the occasional good ones. Apparently this discrepancy against us is due to the fact that there national government has a controlling influence while here it has none, in regard to roads. We have donated nearly 200,000,000 acres of public lands to assist in building railroads, against whose excessive rate charges we now require an Interstate Commerce Commission. We have spent nearly \$600,000,000 in river and harbor improvements and lighthouses to safeguard commerce. It is coming to be understood that drainage of large tracts should be done by the Federal Government and not by states. The logical solution of national good roads is likewise under government supervision and with aid.

The French Government contributed \$612,000,000 to good roads' construction and supervises their maintenance today, with the result that it has the best roads in the world.

Residents in agricultural districts naturally assume that good roads are for the city man with an automobile. This is anything but true. On the contrary, 46 per cent of the population of the United States live on farms or in towns of 2,500 inhabitants or less. Of the billion dollars spent yearly to run our Government, Rural Free Delivery and the Agricultural Department are the two things which are of immediate benefit to the farmer and these cost \$60,000,000, or only 6 per cent. As to the constitutional right of Federal Government to do this work there appears to be no question: In fact, early in the 1800's it was done, but when railroads came into existence the building of highways was dropped. However, portions of these roads, now a century old, are still in use and bear witness to the excellence of their construction. The high character of the work of our Army engineers in irrigation, drainage, and on the Panama Canal, warrants confidence in a good-roads movement under Federal direction, which shall insure a permanent construction and what is quite as necessary—proper maintenance. One plan which seems to be generally approved is for a division of the costs into thirds; the Government, the State, and the counties so improved, each paying an equal amount. As this cost would be spread out over a term of years, the increased value of farm land affected would be much more than the cost to the counties. The Rural Free Delivery News says:

"Good roads help every section of the country, while poor roads are a drain upon the resources of the Nation. Either a high protective tariff or absolute free trade will work to the advantage of some, and to the disadvantage of others. Poor roads are a detriment and an expense to all, and benefit none. When it is considered that every article of food we eat and every item

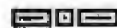
that enters into the manufacture of our clothing must be hauled a greater or less distance over country roads, the question of road conditions becomes paramount."



THE explosion of the magazines which destroyed the French battleship "Liberté" reverberated throughout the civilized world, commanding the sympathy of all nations for the brave men, most of whom died through fidelity to discipline and duty. Had the ship been sunk during an engagement, the fatalities could scarcely have been as large, and would have been attended with the feeling that such was the fortune of war.

*Destruction
of the
"Liberté"*

To perish in a home harbor amid all the surroundings of peace seems a specially hard and undeserved fate. The immediate cause of the disaster will doubtless never be known. It would appear to be a result of the intense development which modern civilization has woven into its great fighting machines. Most likely some wayward electric current, straying from its proper path, wandered about and finally darted through an iron barrier which could have withstood an avalanche and opened its eye in the form of a tiny spark, which awoke the thunders of explosion. Such stray currents are to be found on every modern ocean greyhound. Not infrequently the passenger feels an uncomfortable sting when he thrusts his hands into the wash bowl, and wonders what it is. It is the same beneficent energy that lights and warms his stateroom, keeps it full of fresh air, operates the doors which close the bulkheads after collision, and hurls a cry for help across hundreds of miles of water. From stem to stern, from topmast to keel, like arteries in the human body, every part is penetrated with this network of wires all loaded with invisible fire, constantly alert to escape its bondage. In a battleship this danger is greatly accentuated by the presence of tons of explosives, and really the marvel is, not that one occasionally blows up, but that the terrible events are as infrequent. Also imagine what would have happened had the accident occurred in German waters.



WHEN the submarine became a military success, a thrill of horror passed around the world for it seemed as though no floating craft could possibly protect itself against this unseen foe of the deep. While there yet remains great possibilities for effective work with submarines, they are no longer feared as they were at first. Although it is too early to claim a parallel in the case of the aeroplane in war, it is coming to be generally conceded that the dirigible as a military arm, is rapidly losing its terrors, though for a year all England shuddered every time it looked into the sky and dreamed of a German invasion. The waning reputation

*Aviation
in
War*

of the dirigible airship is emphasized by the destruction of the military aircraft built by the British Government. Its construction was purposely delayed in order to take advantage of the experiments and experiences of other countries, and built at a cost of \$400,000, this mammoth of the air—for it was 512 ft. long—represented what seemed to be the best in a military airship. Yet it collapsed in a 9-mile breeze as it was being taken out of its hangar for a trial.

A great airship such as Count Zeppelin has been operating the past summer is a wonderful creation. As it comes up through a valley with

mountain peaks on either side it moves toward one with an approach like a cloud driven before a gale. Then as it passes overhead the sound of its propellers and the trail of smoke from its engines take it out of the realm of the unnatural; but there is left a feeling almost of awe. Not one of the assembled thousands seemed prompted to cheer; few spoke to their companions. The multitude were silent. Notwithstanding all this there is left in the mind of the observer the positive impression of the frailty of the device and its inability to cope with storm, or the value of its service as a war machine. The dirigible, at present, must have enormous bulk to afford any considerable lifting power; and bulk spells the toy of the winds. Even birds seek shelter from an approaching storm.

The aeroplane has made some good records this year, and the long-distance flights have been greatly lengthened, yet so far I fail to recognize any specific performance by any aviator, which in time of war would have stood between victory and defeat. As an aerial scout the aeroplane will doubtless find a place for itself, but as a fighting machine — well, nobody seems anxious to fire the first big gun, for the recoil and vacuum of its own discharge are things to consider. Can it be possible all our pictures of aerial warfare are only dreams, and that the aeroplane will settle down to a disgracefully safe and prosaic vehicle, used chiefly on farms to fetch the doctor, or some repair part for a broken reaper?

However, the French, with 200 military aeroplanes on hand and 120 building, are extremely sanguine. General Chomer declares that the flying machine is "the most marvelous engine of war we have yet discovered." General Bonneau characterizes it as "an eye that makes no mistake, that looks down on the enemy and permits one to see all that is passing in his lines;" while Colonel Bernard says, "Two batteries with an aeroplane are five times as formidable as three batteries without an aeroplane."

H. H. WINDSOR



BASKETBALL AS FOOTBALL PRACTICE

The head coach of the football squad of the University of Pennsylvania maintains that there is no better method of teaching the players to be fast and snappy in handling the ball and running down the field than making them play basketball.



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View of the Cofferdam around the Battleship "Maine," Showing the Method of Banking the Cylinders to Strengthen Them

EXPERTS BELIEVE LARGE MINE SANK "MAINE"

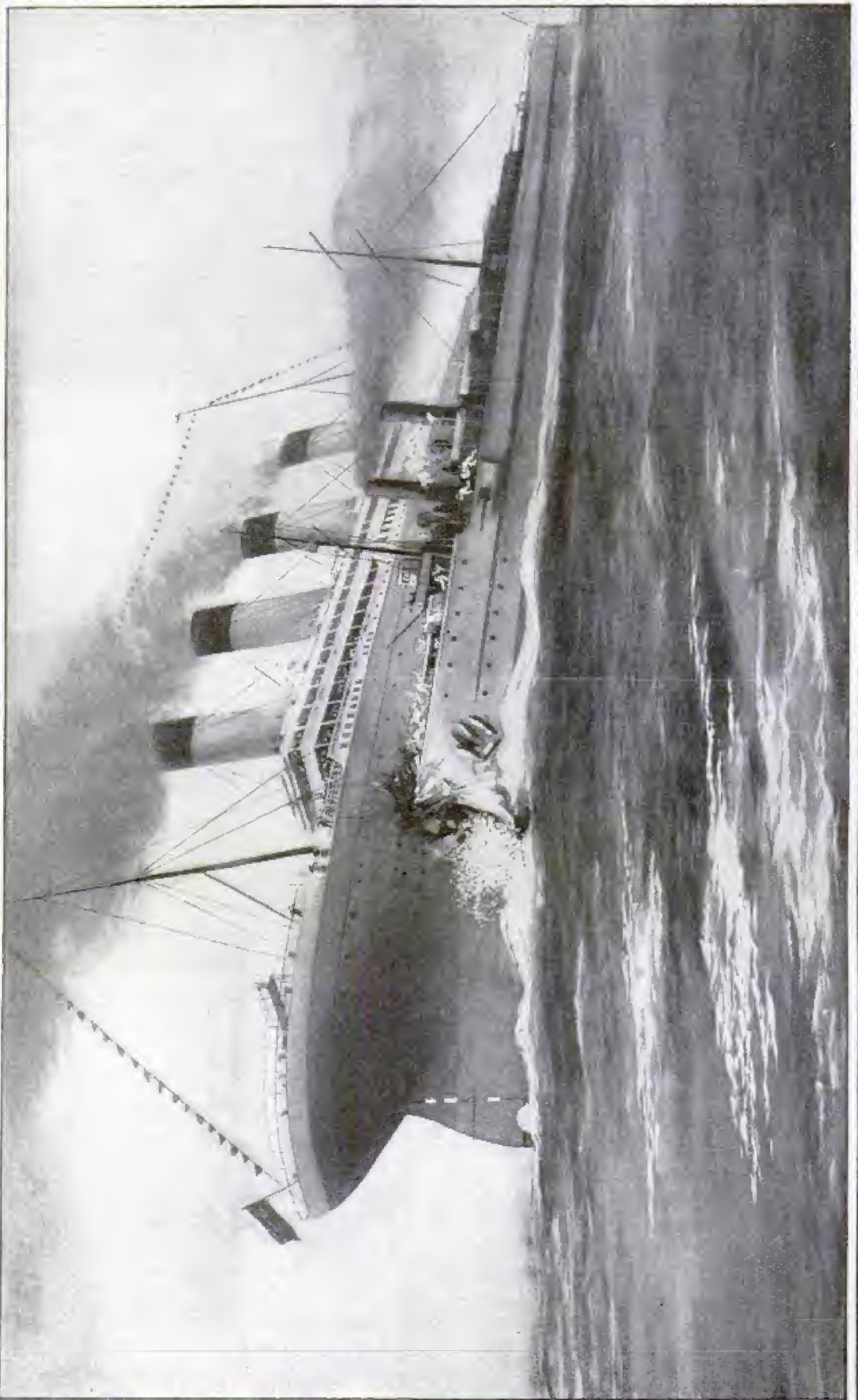
New developments in the examination of the wreck of the battleship "Maine" in Havana harbor tend to confirm the theory that an external explosion caused the sinking of the ship, and it is further stated that so great was the wreckage that experts do not believe a military submarine or torpedo could have been used. It is suggested that only an enormous mine made with a sugarmill boiler, or some similar large receptacle, loaded with powerful explosives, could have caused such a terrific upheaval. The double bottom of the "Maine" was found standing absolutely perpendicular at the point where the explosion is believed to have occurred, thus making the advocates of the external explosion theory more positive in their arguments, as such a state of affairs could not exist as the result of disruption from inside the ship.

The pumping out of the cofferdam has been practically completed, the water having been cleared away from the vicinity of the wreck and nothing but soft mud remaining. The wisdom of the engineers in building up banks of mud and stone on the inside of the dam, against the steel cylinders, is be-

lieved to be justified in the steadiness of the cylinders under the tremendous pressure from without. A view of the entire scene of the operations shows the manner in which this work has been accomplished and also shows the mass of wreckage of the once magnificent battleship. The cutting away of the wreck has commenced and will be continued until the engineers have determined whether or not they will attempt to float the after section. So far no definite plan has yet been made, the final disposal of the wreck awaiting further developments as to its exact condition.

CM. Mamet, a Frenchman, is planning a tour of the world, making all the land journey by way of Spain, Algiers, Tunis, Egypt, India, Australia, South America and West Africa, by aeroplane.

¶The British naval dirigible on which more than \$400,000 has been spent, was completely wrecked when a second attempt was made to test it at Furness, Eng., Sept. 24.



The British Cruiser "Hawke," in Attempting to Pass the "Olympic," was Drawn Out of Her Course Probably by the Suction of the Liner's Propellers, and Rammed the "Olympic." The Warship's Bow Entered the Hull a Distance of 10 Feet

DO PROPELLERS OF MONSTER SHIPS CAUSE DANGEROUS SUCTION?

What distance should a smaller vessel keep from the stern of a liner of the "Olympic" type, when both are going in the same direction, to prevent the suction from the big vessel's screws from drawing the smaller toward her and thus causing an accident similar to that which recently occurred off the English coast when the "Olympic" was rammed by the British cruiser "Hawke?" This is one of the interesting questions that will come before the naval board that is making an investigation of the accident, and its discussion will be of intense interest to naval men, as it means a new menace to smaller craft has developed that must be reckoned with in future construction.

The "Olympic" had steamed out of Southampton and was off Osborne Bay, Isle of Wight, en route to Cherbourg, France, when she was rammed by the "Hawke." The naval vessel was a protected cruiser of about 3,000 tons and was undergoing steam trials after extensive repairs. She was fitted with a ram made especially to sink ships equipped with water-tight compartments. She appeared to the passengers on board the "Olympic" to be going at great speed and it was thought her object was to pass the "Olympic" and head into Portsmouth across the liner's bow. Just as the cruiser's bow came abreast the after starboard quarter of the big steamer, however, she seemed to swerve and dashed into the "Olympic." The ram entered the big hull a distance of 10 ft. and tore a hole 40 ft. in extent. Both vessels stopped, backed and drew away. No one was hurt but it was thought best to run the "Olympic" on a mud bank and summon help for the cruiser from Portsmouth. The water-tight doors closed automatically on each vessel, however, and both vessels were able to proceed under their own steam, the "Olympic"

back to Southampton and the "Hawke" to Portsmouth. The damage to the liner was so great that she was sent to Belfast for repairs which, it is estimated, will require about ten days. She had a record-breaking passenger list and the accident served to increase the confusion that exists in Europe because of the homeward rush of American tourists.

Various theories were put forward to explain the accident, all of them, however, agreeing that the fault, if any, lay with the cruiser. The British naval authorities have not as yet made any statement regarding the cause, but a board has been appointed to make a thorough investigation. It was suggested that the cruiser's steering gear went wrong as she attempted to slow up and cross under the "Olympic's" stern, but eye witnesses incline to the theory that the suction created by the liner's immense screws drew the smaller vessel toward her. The impact of the collision was so great that the "Hawke" was thrown around, her stern describing almost a complete half circle, so that when the ships were stopped, the cruiser's head was pointing in exactly the opposite direction to which she and the liner were originally moving.

The accident occurred almost in the same place the "St. Paul" ran down the British cruiser "Gladiator" four years ago. That accident took place in a blinding snowstorm and the cruiser sank a few minutes afterward.

¶The Wright biplane which was used for the official government test and bought by the War Department, has been placed in the National Museum at Washington.

¶Great success has attended the manufacture of violins and similar musical instruments in Germany by machinery.

GIANT CHEESE WEIGHS OVER FIVE TONS



Experts Mixing Curd for the 12,361-Lb. Cheese Made Recently in Wisconsin

The world's largest cheese, 8 ft. in diameter and 5 ft. high, weighing slightly over 12,000 lb., was recently manufactured at Appleton, Wisconsin, the services of more than 40 expert cheesemakers and their experienced helpers being required for the job.

The cheese, which was made for exhibition at the National Dairy Show at Chicago contained exactly 12,000 lb. of curd, 330 lb. of salt,



The Largest Cheese in the World Ready for Shipment

and 31 lb. of rennet, making the finished product weigh 12,361 lb., three times larger than the biggest cheese ever before manufactured. The curd came from 32 different cheese factories, and the milk, 18,000 gallons in quantity, from over 1,200 farmers and was produced by 8,000 pure breed Holstein and Guernsey cows valued at \$1,500,000. The

greatest care had to be taken to insure the curd being uniform.

The giant hoop or form, of galvanized iron, was especially designed. It was 8 ft. in diameter and 5 ft. high. Twelve heavy steel bands, 24 ft. long, were placed around the hoop to make it withstand the enormous pressure obtained by the immense jack-screws placed on the ends, or "followers," and pressing against the frame.

Four heavy oak timbers below the hoop and as many above, bound together with 20 heavy steel bolts, 5 ft. long, formed the frame that was built on the lines of the old-style upright screw press. The followers or ends were four thicknesses of 2-in. oak planks. The hoop alone weighed nearly 3,000 lb.

No building in Appleton was large enough for the manufacture and care of the cheese and it was made in the open air. The hoop was placed on a platform in front of six big vats, 15 ft. long, 4½ ft. wide and 2½ ft. deep, in which the curd was washed and mixed.

Under the supervision of the state dairy and food commissioner, 2¾ lb.

of salt was used to each 100 lb. of curd and when the salt was thoroughly mixed with the curd it was carried in pails to the form or hoop where it was packed with heavy iron tampers which were wrapped with cheesecloth.

It took five hours to manufacture the cheese after the curd was delivered and so solidly had it been packed that it pressed down but a few inches under the enormous pressure. Two days later the cheese was trimmed, the bandage of heavy cotton cheesecloth which fitted the form like a glove, was carried over the top and the gigantic cheese was moved into a warehouse by a house-mover.

The form is of such enormous size that it was impossible to find a cold-storage plant in the middle west in which it could be stored to "cure" and it was necessary to build a special refrigerator, 12 by 15 ft. about it. A specially equipped flat car was provided to ship it to Chicago. It was expected the cheese would score about 96 per cent in the test at the show.

FRENCH BATTLESHIP BLOWN UP IN TOULON HARBOR

The blowing up of the powerful French battleship "Liberté" in the Harbor of Toulon, early in the morning of September 25, adds another appalling disaster to the fatal record, which, in the past five years, has given the French navy the reputation of being the most dangerous to itself of all the navies of the world. All the fatalities have occurred at Toulon, which is the great naval base of France, and in them about 400 men have lost their lives. The first of the series of disasters occurred in February, 1907, when nine men were killed by the explosion of a torpedo boat. This was followed a month later by the explosion of the battleship "Iena," sacrificing 107 lives. In August, 1908, a gun explosion on a gunnery school ship killed six; in September, 1910, an explosion on a cruiser killed 13, and

Sept. 10, 1911, six men were killed by an explosion on the cruiser "Gloire."

The disaster to the "Liberté," resulting in the death of about 250 men, was due to fire so located that the fumes rising from one of the magazines made it impossible to reach and open the sea valves so that all the magazines could be flooded. According to the cable reports five explosions occurred, the first four, at minute intervals, being light, followed by the final terrific detonation which rent the ship to pieces, hurling men through the air with the wreckage, and sinking the boats bearing rescue parties from the other battleships anchored near by. So powerful, indeed, was this last explosion, that the commander of a gunnery school ship anchored a mile distant, was killed by a fragment of shell, almost a score of men were



Destruction of the French Battleship "Liberte" in Toulon Harbor, September 25



Battleship "Liberte" as She Appeared at the Hudson-Fulton Celebration in New York

killed on the battleship "Republique," anchored about 700 ft. distant, and the battleships "Verité," "Republique," and "Democratique" were so damaged as to be put out of commission for some time. One of the missiles hurled against the side of the "Republique" was a 37-ton steel plate. Among the small boats sunk was a large steam launch, found by divers between one of the battleships and a cruiser.

Rumors to the effect that enemies of France had blown up the "Liberté" were rife in Toulon and Paris the day after the disaster, and fuel was added to this popular suspicion by the statement that fire was also discovered on the "Patrie" and another battleship. The general opinion among naval men seems to be that the disaster was due to the deflagration of "B" powder, as in the case of the "Iena." Some reports, in fact, laid all the accidents which have more or less discredited the French navy to the type of powder used, but M. Delcasse, minister of marine, insists that "B" powder was not responsible for this explosion.

Experiments recently completed have demonstrated the fuel value of Nile "sudd," a combination of papyrus and other aquatic growths, and a company has been formed to prepare it for the market.

MASK OF HAMMERSTEIN ON LONDON OPERA HOUSE

Among the many masks of great men of the musical world appearing in the architecture of Oscar Hammerstein's beautiful opera house in London, is a mask of himself. The presence of his mask among the others was discovered by accident.



Mask of Oscar Hammerstein on His Opera House in London

A NEW chapter in the history of aviation was opened by the governments of Great Britain and the United States when the officials of both powers sought, by establishing aerial postal routes, to demonstrate the worth of the aeroplane in some other field of usefulness than the military service. Aside from these experiments the month of September will be partic-



Dropping a Letter in the Special Letter Box for the English Aerial Post at Hendon, Eng.

ularly notable in future chronicles of the progress of aerial science because the death list of airmen was greater than during any similar period since man began to fly. No less than sixteen men lost their lives. One of these was killed by a blow from a propeller blade of a machine about to start and another died from injuries received in February last. There was probably more flying during September than at any other time during the year. This was so not only because of the beginning of the county-fair season in the United States, exhibitions of flight having become a feature of these annual shows, but because there were two big aviation meets in America and aeroplanes were used extensively in military maneuvers in Europe.

The post office experiments probably hold the greatest interest for those who are seeking a practical use for the aeroplane in time of peace. The English experiment began Sept. 9 with

the establishment of a postal route through the air from Hendon to Windsor, a distance of 22 miles. Special letter boxes were erected for the aerial post and the mail was restricted to post cards and letters. The postage rate was 13 cents for post cards and 26 cents for letters. The service continued only a short time, being abolished by order of the postmaster-general, Sept. 23.

In the United States the experiments were carried on in connection with the international aviation meet held on Long Island, the route being from Nassau Boulevard to Mineola. Earl Ovington and Tom Sopwith were the mail carriers selected for the work, and on their first trip they carried 6,165 post cards, 781 letters and 85 pieces of printed matter. The mail was delivered to the postmaster of Brooklyn at a special post office established at Mineola and from that point was distributed by a regular carrier. Postmaster-General



Aerial Postman Hamel Receiving a Bag of Mail at Hendon, Eng., to be Delivered at Windsor

Frank H. Hitchcock participated in these experiments personally, flying over the route with Captain Paul Beck, U. S. A., in one of the army aeroplanes.

The unusually large mortality among aviators was marked by at least two accidents that could have been avoided but for the submission of the unfortunate airmen to unrea-

sonable demands of crowds at two exhibitions. The first of these resulted in the death of J. J. Frisbie, one of the most careful and best known of the Curtiss flyers, at the Norton, Kansas, county fair, Sept. 1. He was disinclined to fly because of the exceptionally high wind, but was goaded into making an attempt by the taunts of the spectators. He had only risen 100 ft. in the air when his machine was caught in a gust and dashed to the ground. Frisbie was terribly injured and died an hour after the fall. Practically the same circumstances attended the death of Frank H. Miller at Troy, Ohio., Sept. 22, the poor condition of his machine being the cause of Miller's reluctance to make a flight. Two hundred feet from the ground his gasoline tank exploded. The machine dropped like a shot. Miller was burned to death.

The most noted of the air-men killed was Edouard Nieuport, the Frenchman whose improvements of

next day without regaining consciousness. The others added to the month's death list include: M. Maron, at Chartres, France, Sept. 3; M. LeForrestier at Huelva, Spain, Sept. 4; Charles Tenaud, at Lima, Peru, Sept. 7, from injuries received by a fall last February; Lieut. Newmann of the German army and M. Leconte, at Mulhausen, Germany, Sept. 7; Lieut. Chotard,



United States Aerial P. O. Station No. 1, Mineola, L. I. Turning Mail Over to Carrier for Delivery



Earl Ovington, the American Aerial Postman, Flying from Nassau Boulevard to Mineola, L. I., with Mail

the aeroplane have produced the fastest monoplane in existence. Nieuport was serving as a sapper with the French army at Verdun, France, during the annual maneuvers. His machine was caught in a gust as it was rising from the ground Sept. 16 and capsized. The airman was unconscious when removed from under the wreckage of the machine, and died the

of the French army, at Villacoublay, France, Sept. 12; Frank Paine, at Albion, N. Y., Sept. 14; Lieut. R. A. Cammell, of the British army, at Hendon, Eng., Sept. 17; John W. Rosenbaum, at De Witt, Iowa, Sept. 19; Tony Castellane, at Mansfield, Penn., Sept. 22; Ray J. Raymond, mechanic for Amadee V. Reyburn, Jr., struck on the head by the propeller of the Reyburn machine, at St. Louis, Mo., Sept. 22; Dr. J. C. Clarke, inventor of the famous "loop the loop" bicycle trick, at the international aviation meeting, Nassau Boulevard, L. I., Sept. 25; and Capt. Englehardt, Berlin, Germany, Sept. 29.

Some little time will yet elapse before the expiration of the time limit of the American coast-to-coast aeroplane race in which three men started. Two continued their flights up to Oct. 1 and may finish. This is the longest cross-country race yet attempted and presents many more difficulties than any of the European circuit flights.

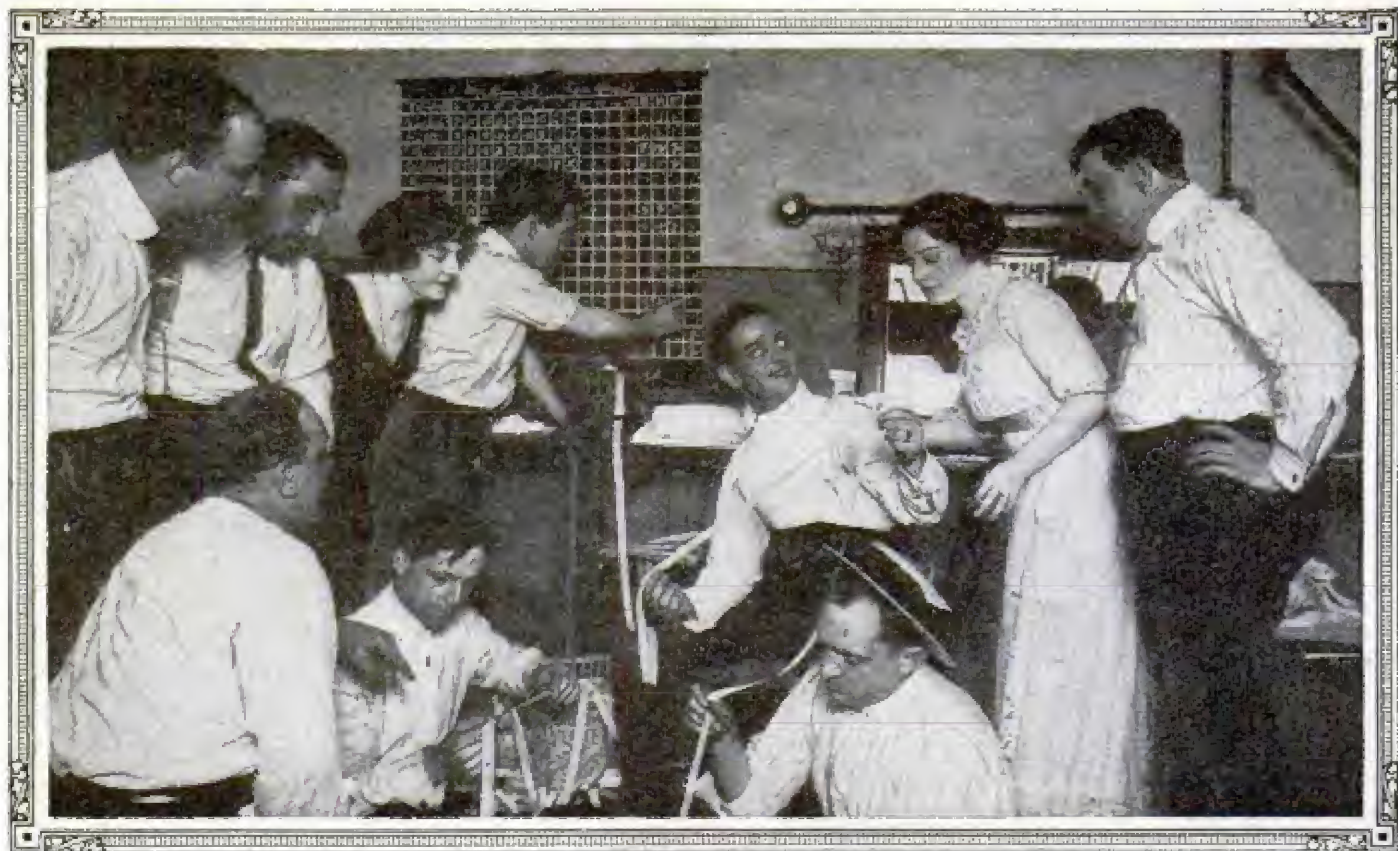
R. G. Fowler was the first starter, having gone into the air Sept. 11 at Golden Gate Park, San Francisco. He made a good flight the first day, but since then has had all sorts of engine troubles and once wrecked his machine completely. Up to Oct. 1 he had not yet completed the passage of the Sierras.

J. J. Ward, the second to start, left Governor's Island, N. Y., Sept. 13 and C. P. Rodgers, the third entrant, started from Sheepshead Bay, N. Y., Sept. 16. Both airmen from the east fought with adverse weather conditions and motor trouble from the start. Both were stalled repeatedly and compelled to wait several days at a time for repairs to their machines. Ward finally announced his abandonment of the race Sept. 22. He had reached Hornell, N. Y., about 310 miles from his starting point. Rodgers stuck to the job, however, and on

Sept. 28 made one of the most remarkable flights in the history of the science, covering a distance of 203 miles from Salamanca, N. Y., to Kent, O. He was due to arrive in Chicago Oct. 1.

The international aviation meeting at Nassau Boulevard, Long Island, was made notable by the fact that it was attended by no less than five women who hold pilot's licenses, three of whom came from France. Claude Grahame-White was also a contestant at this meeting and at the international meeting at Boston just before the Long Island meet began.

Two new world's records were established during September. Roland G. Garros ascended to an altitude of 13,776 ft. at St. Malo, France, Sept. 4. On Sept. 23, M. Mahein rose with a passenger to an altitude of 2,465 meters (8,087.25 ft.), setting a new mark for such performances.



Courtesy of Vanity Fair

BASEBALL MAKES THE WHOLE COUNTRY KIN

It is not usual to find tickers carrying the baseball scores in other than newspaper offices and in public places where a considerable number of people congregate in the afternoons, but so intense was the interest in the national game during the season that has just closed that private ticker service was resorted to in more than one instance. The illustration shows a ticker service installed behind the scenes of one of the Chicago theaters so that the actors could get the score immediately after each inning.



The Section of the Fence Torn Away When the Car Crashed Through. The Wrecked Machine is Seen at the Point Where It Stopped. Men and Women Were Packed Six and Seven Deep Against This Fence When the Catastrophe Occurred

THE "GAME NOT WORTH THE CANDLE" KILLS ELEVEN

Since the article written by Barney Oldfield was published in this magazine, stigmatizing automobile racing as a game not worth the candle, Lee Oldfield lost control of his powerful Knox racer while speeding around the track at the state fair, Syracuse, N. Y., and eleven spectators lost their lives. The accident, one of the most tragic in the annals of automobile racing, occurred Saturday, Sept. 16. Lee Oldfield is said to be no relation of Barney Oldfield.

The leap of the great car from the

track into the mass of humanity packed six and seven deep against the fence, crushing and maiming those in its path, was due to the bursting of the right front tire, which is a common cause of accident in such racing. The tire which burst had become so worn that a good share of the tread could be seen flapping as the machine sped over the course just before the accident.

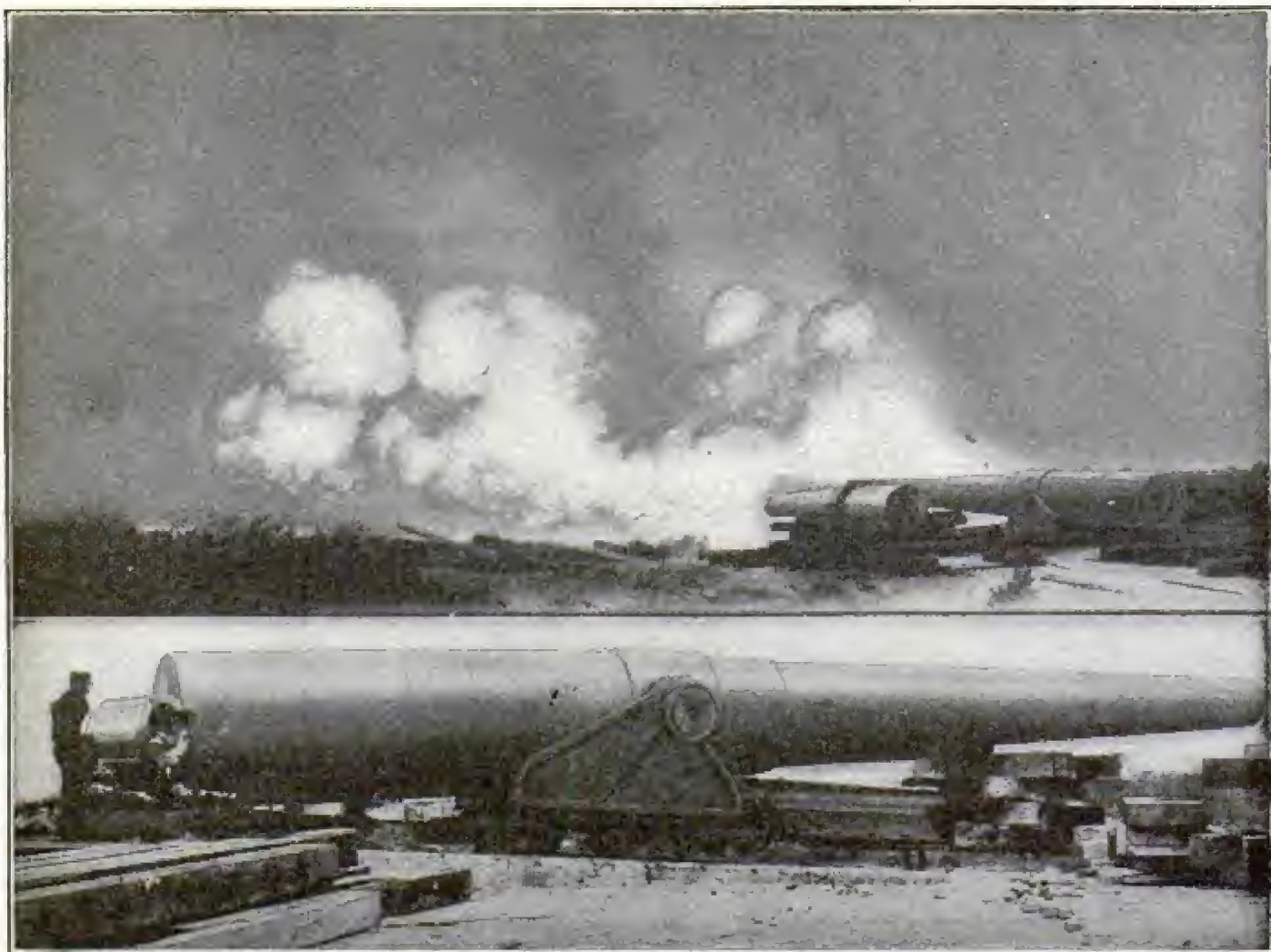
¶An election in a small French community was recently postponed because a flying exhibition occurred on the same day.

NEW 16-INCH GUN SHOTS 2,400-POUND SHELL 22 MILES

The biggest gun in the world was built primarily to guard the biggest canal in the world. This enormous engine of destruction is a 16-in. breech-loading rifle, the newest weapon designed for the sea-coast defense of the United States and its insular possessions, the first one completed being intended for the Panama Canal. The total length of the gun is 49 ft. 2.9 in. It has a diameter of 60 in. at the breech, tapering to 28 in. at the

muzzle. If smokeless powder is used, it is estimated that a full charge of 576 lb. will throw a projectile weighing 2,400 lb. a distance of 22 miles. The projectile prepared for the monster is 5 ft. 4 in. long, and it has been calculated that it would go through a steel plate 42.3 in. thick, if the plate was placed at the muzzle.

Should a 16-in. gun be placed at the Battery, New York, the circle inclosing its zone of fire would pass through



First of the New 16-Inch Guns for Sea-Coast Defense—This One will be Mounted at Entrance to Panama Canal

Hempstead and Long Beach on Long Island, and its shells would pass far above Staten Island and fall a half mile beyond the Atlantic Highlands. If Mont Blanc were placed on top of Pike's Peak the projectile would clear the combined height with more than the height of the Washington monument to spare. This is far greater than the maximum range of any other gun up to the present time.

The total weight of this American monster is 130 tons. What would happen to a vessel when hit by one of its projectiles can only be surmised. The French battleship "Liberté," which blew up the other day, would probably look like a slightly damaged ship beside it. Other rifled guns of large caliber heretofore constructed are the Italian gun, caliber 17.75 in., the French gun of 16.5-in. caliber and the Armstrong gun of 16.25-in. caliber. The greatest gun ever built by the Krupps had a range of 12½ miles.

None of these compare in point of energy and range with the newest American product.

This immense rifle, which was built at the Watervliet Arsenal, is now at the Proving Grounds at Sandy Hook and no date has as yet been determined upon for its removal to Panama. It is expected that guns of the same type will be placed in the fortifications in the Philippines and in Hawaii. American ordnance experts are elated over the success that has attended the experiments with the new gun.

¶The auxiliary cruiser "Siren," recently purchased from the United States navy by a number of Americans residing in Honduras and subsequently presented by them to the Honduras government, has been stripped of her military armament and put to work as a freighter for the development of the country's commerce.

The Puzzle of the Electric Light Bill

The First of Two Articles on the Cost of Electric Service in the Home

By HENRY TARKINGTON



HOW much do you pay the electric-light company for the privilege of reading your evening paper? You arrange the cushions in your easy chair. You place the droplight just right and turn on the current that makes the filament in the bulb glow and shed a soft yellow refulgence over the printed page that gives you your latest intelligence of the crimes of the republican party, the misdemeanors of the democrats, the newest outrage of the predatory rich, or the newest method of cutting a bias fold of voile to keep these modern tight skirts from bagging—well, where they are most likely to bag. But do you know how much you pay for the pleasure, the entertainment, and the instruction you get?

To put it a little differently: Do you really know whether you buy electricity by the pint, pound or package? You have an accurate knowledge of how potatoes are sold, you are careful to weigh the sugar that comes from the grocer to see that he has given you the right measure, and you watch the salesperson who measures out your cloth in the drygoods shop to make sure you get what you are paying for. But do you watch the electric current to see that you are only charged with what you are consuming? And do you scheme and plan to make the current you are getting go as far as you do the roast of beef you bought Saturday—because you can have it hot on Sunday, sliced cold for lunch Monday and made into croquettes for Tuesday's breakfast?

You know that a ton of coal should last you so long and if it doesn't you make it your business to learn the reason why. You know you pay 80 cents, or thereabout, per thousand feet for gas and that you should normally burn a certain number of feet. But how different with the electric light!

Not long ago an indignant housewife flounced into the office of the claim agent of a big electric-light company. She was all fussed up about something. She banged her bill down on the polite official's desk.

"What do you mean by any such statement as that?" she demanded.

"What is the trouble, Madame?"

"Why there, there—on that bill!! You've charged me with using my lights 45 kilowatt-hours! It is outrageous. Our lights do not burn an hour in the day and that would make the bill only 30 hours if we were at the house all the time. And we weren't there for two weeks. I won't pay any such price. I'll burn gas. The idea."

The lady was sent home mollified but it took the patient claim agent a long time to accomplish the task. She didn't know a kilowatt-hour from a pipe wrench. And she had not made any effort to inform herself positively.

Another irate householder protested against paying a bill of \$4.50 for a month's supply of current because he was charged with burning 45 kilowatt-hours when he used only tungsten lamps and a toaster. There wasn't a kilowatt in the house, nor any other kind of motor!



"She didn't know a kilowatt-hour from a pipe wrench"

Still another man charged the people who furnished him current with swindling him, because his chafing dish, percolator, toaster and two-heat hot plate, when he attached them to the droplight over his dining-room table would blow out a fuse and he had purchased a four-way plug so that they could all go on the same socket without disturbing the second socket needed for the incandescent lamp. He didn't know that he was putting too much of a load on the wire and that it was pure luck that he hadn't set his house afire.

It's the business of power concerns to sell all the electric current they can,

but it is also their business to make it as cheap as they can. They print instructions for reading the meters and keeping tab on the amount of current in plain figures on their bills. But it comes as a monster surprise to the consumers that they are really buying electricity just as they are buying milk or eggs or coal; that it is furnished in known quantities, and that economy in its use will make it go twice as far at half the cost. Electricity can do all the work in the home. It can sweep and dust; it can cook and wash and iron; it can lighten the labor as well as the room and it can absolutely amputate that drudgery which, as the vermillion appendix of housekeeping, claims its thousands of victims yearly.

Primarily the thing to solve is the puzzle of the electric-light bill in its present form. It is important that the consumer should know just what the various terms mean, and they are as simple as the pint or the pound or the yard measure. Once these are understood, once the user of electricity knows what he is using, he will soon learn how to get the most out of the smallest supply of current.

With the aid of simple arithmetic, nothing more than easy multiplication and division, one can figure out the cost of a bill for electric service.

To begin with, it is necessary to understand what you really pay for in

ROOM OR PLACE WHERE LAMPS ARE USED	Number of Lamps	Hours a Day Lamps Are Used	Watt-Hours Consumed per Day	Watt-Hours per Month of 30 Days	Kilowatt- Hours per Month	Cost per Kilowatt- Hour	Total Cost per Month
Kitchen	1	3	150	4,500	4.50	\$0.10	\$0.45
Dining Room	2	1	100	3,000	3.00	0.10	0.30
Living Room	3	2	300	9,000	9.00	0.10	0.90
Bathroom	1	1	50	1,500	1.50	0.10	0.15
Bedroom	2	1	100	3,000	3.00	0.10	0.30
Bedroom	2	1	100	3,000	3.00	0.10	0.30
Store Room	1	negligible	.....	.....	.....	.....	.....
Basement	3	negligible	.....	.....	.....	.....	.....
Corridor	1	$\frac{1}{2}$	25	750	0.75	0.10	0.07 $\frac{1}{2}$
Stairs	1	$\frac{1}{2}$	25	750	0.75	0.10	0.07 $\frac{1}{2}$
Hall	1	2	100	3,000	3.00	0.10	0.30
Porch	1	negligible	.....	.....	.....	.....	.....
Totals	19	.....	950	28,500	28.50	.....	\$2.85

TABLE 1—A worked-out example of electric-light costs for an average small-sized house using carbon-filament incandescent lamps of 16-candlepower each.

buying electric service. Suppose you had to perform a certain amount of work and hired a man with an engine of 5 horsepower to do it. It will be assumed that the engine takes 4 hours to do the work. Now if we call the amount of work that an engine of 1 horsepower will do in 1 hour a "horsepower-hour"—this is merely an arbitrary term—it is obvious that the engine of 5 horsepower will do 5 horsepower-hours of work in 1 hour, or 20 horsepower-hours in 4 hours. Another man with an engine of 10 horsepower would do the same amount of work in 2 hours, for he would do 10×2 , or 20 horsepower-hours of work.

Now what do we pay for, the horsepower or the horsepower-hours? Obviously the latter.

In the case of electric service we use another unit, similar to the horsepower in kind but not in quantity. This unit is called, just for want of a better name, a "watt." Thus, on an electric toaster, for instance, there may be seen a little plate on which is marked "500 watts," which means that the toaster takes 500 watts of electricity to heat it properly. (There are 746 watts in a horsepower.)

But we do not pay for watts any more than we did for horsepower in the above example. It is work or energy that costs money. Thus we establish another unit similar to the horsepower-hour and call it a "watt-



It was pure luck that he hadn't set his house afire"

hour," which means the quantity of energy developed by a watt in one hour. Thus the 500-watt toaster would consume 500 watt-hours of electricity in 1 hour, or 1,000 watt-hours in 2 hours, 1,500 in 3 hours, and so on.

When we consider large quantities of electric current, it is convenient to use a larger unit than the watt. The one chosen is called the "kilowatt" which is simply 1,000 watts. Similarly, the "kilowatt-hour" is equal to 1,000 watt-hours. The electric-light companies charge for their electrical energy by the kilowatt-hour, so this unit is very important. As all small lamps

ROOM OR PLACE WHERE LAMPS ARE USED	Lamps	Hours a Day	Watt- Hours a Day	Watt- Hours a Month	Kilowatt- Hours a Month	Cost per Kilowatt- Hour	Total Cost per Month
Kitchen.....	1 20-candlepower, 25-watt	3	75	2,250	2.250	\$0.10	\$0.22 1/2
Dining Room.....	1 48-candlepower, 60-watt	1	60	1,800	1.800	0.10	0.18
Living Room.....	2 32-candlepower, 40-watt	2	160	4,800	4.800	0.10	0.48
Bathroom.....	1 20-candlepower, 25-watt	1	25	750	0.750	0.10	0.07 1/2
Bedroom.....	1 32-candlepower, 40-watt	1	40	1,200	1.200	0.10	0.12
Bedroom.....	1 32-candlepower, 40-watt	1	40	1,200	1.200	0.10	0.12
Store Room.....	1 20-candlepower, 25-watt						
Basement.....	3 20-candlepower, 25-watt						
Corridor.....	1 20-candlepower, 25-watt	1/2	12.5	375	0.375	0.10	0.03 3/4
Stairs.....	1 20-candlepower, 25-watt	1/2	12.5	375	0.375	0.10	0.03 3/4
Hall.....	1 20-candlepower, 25-watt	2	50	1,500	1.500	0.10	0.15
Porch.....	1 32-candlepower, 40-watt						
Totals.....	15 Lamps		475	14,250	14.25		\$1.42 1/2

TABLE 2—A worked-out example of electric-light costs for an average small-sized house using tungsten lamps of various candlepowers.

and apparatus are rated in watts, we will calculate their energy consumption first in watt-hours, and then divide by 1,000 to bring this to kilowatt-hours, and finally multiply the number of kilowatt-hours by the price in cents charged per kilowatt-hour, the answer being the amount of the bill in cents.

The problem, however, is not quite so simple as this in most cases, for nearly all the companies have a system of charging for current by a double rate; that is, a certain proportion of the current is charged for at a high or maximum rate, and the rest at a low or minimum rate, subject to certain discounts. In the first place it will be assumed that all current will be at the rate of 10 cents a kilowatt-hour—a fair average in large cities in this country—and with this assumption the cost of electric service will be calculated for incandescent lamps and various electrical utensils and other devices.

The ordinary carbon-filament incandescent lamp of 16 candlepower consumes 50 watts of electric power. Suppose that in a 6-room house, comprising a kitchen, dining room, living room, two bedrooms, and store room, besides a bathroom and a basement, there are used 19 carbon lamps of 16 candlepower each, distributed as follows: kitchen, 1 lamp; dining room, 2 lamps; living room, 3 lamps; bathroom, 1 lamp; bedrooms, 2 lamps each; store room, 1 lamp; basement, 3 lamps; corridor, 1 lamp; stairs, 1 lamp; entrance hall, 1 lamp; porch, 1 lamp.

The number of hours a day that these lamps are in use varies, of course, with the season of the year and with the family requirements. As an average case, suppose that the kitchen lamp is used 3 hours a day for 30 days a month. The lamp takes 50 watts. Therefore in one hour it consumes 50 watt-hours of electrical energy. In 3 hours (that is, one day) it uses up 50×3 , or 150 watt-hours. In 30 days, or one month, the amount consumed is 150×30 , or 4,500 watt-hours. Dividing the watt-hours by 1,000, to obtain the num-

ber of kilowatt-hours, it is apparent that in one month the kitchen lamp uses $4\frac{1}{2}$ kilowatt-hours of electricity which, at the rate of 10 cents a kilowatt-hour, would cost 45 cents. Table I shows the figures for all of the rooms, each case being worked out precisely in the same way as the above example. In some of the rooms all of the lights will not be used all of the time, so that the estimated hours a day in these cases are apparently low. On the whole, perhaps, the figures are rather overestimated, but no two homes would be exactly alike and the example here given is only meant to indicate the general procedure to be followed in each particular case.

If tungsten lamps were used, the total cost for lighting would be very much smaller, although the initial cost for the lamps would be greatly increased. Assuming that the same amount of light were used—that is, the same total candlepower for the same number of hours—the cost for current would be about one-third. That is, the monthly bill for light would be one-third of \$2.85 (see Table I), or \$0.95.

The candlepower of a tungsten lamp of given "wattage" (power expressed in watts) varies according to the make. Some lamps are stated by the manufacturers to deliver one candlepower for each watt, but usually one candlepower takes 1.25 watts. The larger figure will be assumed here. A 40-watt tungsten lamp, at this rate, would give a light of 32 candlepower, and one of these lamps can easily be identified by the "40w" which appears on a little printed tag pasted on the globe near the screw plug—and so for lamps of other wattages. Carbon lamps are identified by the candlepower, the wattage not being indicated, perhaps for obvious reasons.

As a rule, when tungsten lamps are employed, more illumination is obtained than when carbon lamps are used. The light also is much whiter and more pleasing, its intensity being softened in many cases by the use of frosted lamps or light-diffusing globes. Table II

shows a worked-out example of the house considered previously, using tungsten lamps of somewhat higher total illumination than the carbon lamps of Table I. It will be seen that the amount of the bill is cut down one-half, although the total candlepower used is 388, as compared with the 304 candlepower of the carbon lamps. The saving in cost and the increase in illumination are obvious.

The probable cost for lamp renewals

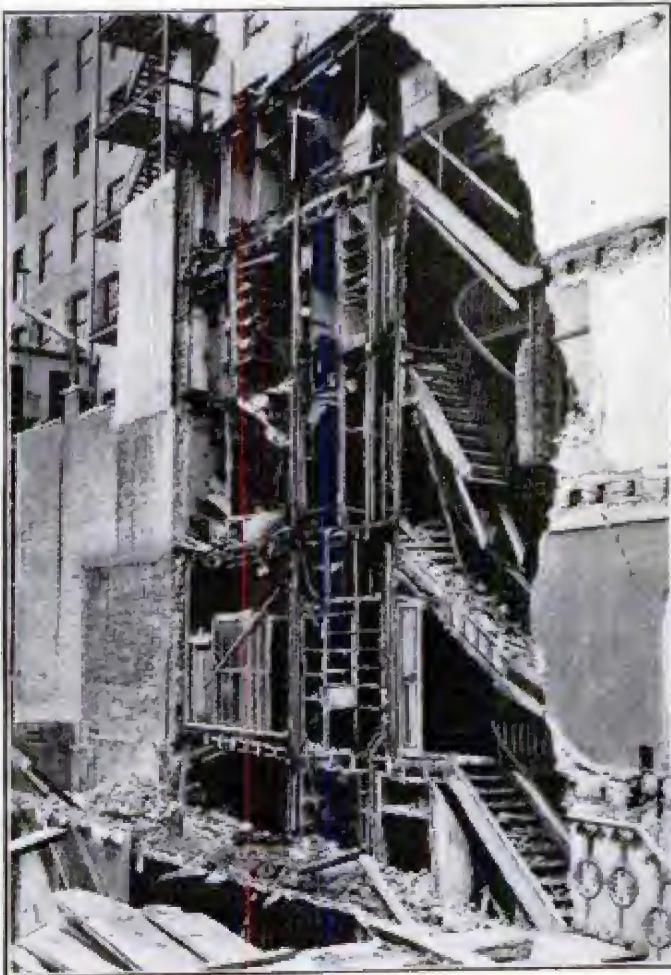
will now be estimated. In Chicago, carbon lamps are supplied free by one big electric-light company, or the customer can obtain a discount of one cent a kilowatt-hour by furnishing his own lamps. If the customer uses electricity only for lighting purposes, it will pay him to obtain his lamps from the company, but if he uses a fair amount of current for other purposes it will be cheaper to take the discount and buy his own lamps.

[The second article on this subject, which will appear in the December issue, will tell how to estimate the probable cost of current for electric cooking and heating appliances and other electric conveniences, and to obtain the same quantity of electricity legitimately for less money.]

BUILDING COLLAPSES FROM FAULTY CONSTRUCTION

Two examples of faulty construction in buildings are shown in these illustrations of partial collapses in New York. In one of the examples a large section of the wall of a tall building fell when the adjoining building was

removed, which indicates that its builders were depending too much upon the adjacent wall as a brace. The other example is the sudden sagging of one corner of a narrow building, due to the breaking of a peculiar box-shaped cap



Collapse of Side Wall Due to Removal of Adjoining Wall



Partial Collapse Due to the Old Type of Supporting-Column Heads

straddling the flat top of the shaft of the cast-iron columns supporting the wall. The lower connections of this box broke and allowed it to fall about a foot.

RAT PHOTOGRAPHS HIMSELF

A remarkable flashlight photograph of a mountain rat nibbling a candle, procured in an ingenious way, is shown



Attached to the Candle was a Thread Which Closed an Electric Circuit and Caused the Flash by Means of Which this Rat Photographed Himself

in the accompanying illustration. The picture was taken by the rat himself, automatically. As he pulled the candle from the box, a thread, fastened to its end, closed an electric circuit and caused a flash. The lens of the camera had been left open, and attached to it was a clock mechanism which closed at four o'clock in the morning, so that daylight would not fog the plate. The photographer never saw the rat himself.

FRANCE BUILDING MONSTER SAILING SHIP

Undaunted by the fate which has overtaken the several monster sailing ships built in the last 10 or 15 years, a French shipping concern is now building a 5-masted schooner of 10,180

tons' displacement. She will be 430 ft. long, and will have a beam of 57 ft. and a draft of 28 ft. She will not, however, depend altogether on wind for power, as she is to be equipped with two internal combustion engines developing 1,800 hp., each engine driving a propeller. She will also have a steam engine for operating steering gear, electric-lighting purposes, etc.

The vessel will be used in regular freight service between French ports and the French penal colony of New Caledonia, and will also carry a limited number of passengers.

WOODEN WATER MAINS USED ONE HUNDRED YEARS

The wooden water mains shown in the accompanying illustration were taken up along Beckman street, New York, during the past summer to make way for a cast-iron fresh-water line and the high-pressure salt-water lines for fire protection. Regardless of the fact that the wooden line was laid a century ago by a water-supply company of which Aaron Burr was the leading spirit, it was still supplying water to the buildings along the street just before being taken up. The logs forming it were 10 to 14 in. in diameter and from 16 to 20 ft. long, with a 2½-in. hole bored through them. The log designated as A in the illustration shows the spigot end, and B the socket end of two sections.



Wooden Water Mains Laid a Century Ago in New York and Still in Service in July of This Year

COAL AND IRON REFUSE AS BUILDING MATERIAL

The great heaps of refuse adjoining coal and iron pits throughout Scotland, heretofore regarded as waste product, are now being found valuable in the manufacture of bricks, while a new industry has recently been started in Glasgow to utilize "coke breeze" in the manufacture of building slabs. These slabs, varying in size from 2 ft. to 3½ ft. in length, 1 ft. in breadth, and from 1 to 4 in. in thickness, composed of coke breeze and Portland cement, are being manufactured as a fireproof material for interior partitions. They also have the quality of thoroughly deadening sounds, and may be built up from the floors without beams or other structural detail.

THE SAND-BLAST COSTUME

The men employed in operating the nozzles of sand-blast apparatus in England are usually garbed in a costume and mask which give them a strange headless appearance. Such a garb is worn by this operator, who is burnishing the end of a section of a rail, being laid during the extension of a tramway system. The head is completely inclosed, and air for breathing is provided through a small hose entering the top of the helmet.



Strangely Garbed Operator of a Sand-Blast Nozzle at Work in a London Street

BILL-POSTING CREW IS HOISTED BY DERRICK

Bill-posting space is considered so scarce within the Chicago loop district that theatrical agents watch for every



Bill-Posting Space Which was Used by Employing a Crane as a Means of Reaching It

possible area and make use of it. In the illustration is shown a bill-posting crew hoisted by a derrick being used in the basement construction of a skyscraper. They are plastering show bills on a wall which was left bare when the adjoining building was wrecked to make way for the new.

Workers for the uplift in China were greatly elated over the reported increase from 31,963,000 to 334,700,000 in the imports of needles in the province of Szechwan, until they learned that the needles were placed point upward on the ridgepoles of the houses to keep the birds away and were not used for industrial purposes.

HOUSE HAS STREET-CAR BAY-WINDOWS

The street car incorporated as a feature in this curious house, which is in Bridgeport, Conn., was originally used



This Curious Architecture is the Result of Additions to a Street Car from Time to Time

as the gathering place of a social club. Additions were made from time to time and, as a result, the street-car portion became two spacious bay-windows or sun parlors.

ONE-HUNDRED-FOOT BRIDGE OF BAMBOO

The government engineers in Java have recently constructed a road bridge more than 100 ft. long, with a central span of over 60 ft., completely of bamboo. Even the roadbed is composed of bamboo matting, covered with a layer of earth. The bridge resembles a steel structure in profile, but all the members are bamboo rods. It is estimated that such a bridge should last about 15 years.

Ⓒ Thomas Kinsey, purser of the transatlantic liner "St. Paul," has crossed the ocean 1,000 times, traveling about 3,000,000 miles.

MAMMOTH DRYDOCK FOR BIG BATTLESHIPS

As battleships are built larger year by year, the Navy department will recommend to Congress the construction of a mammoth drydock at New York or Norfolk, Va., exceeding in size any naval dock in this country. The tentative plans for the dock contemplate a length of 1,000 ft., nearly 200 ft. greater than any American dock built or building, a beam of 110 ft., the width of the Panama Canal, and a depth of 34 ft.

Were the battleships "Wyoming" and "Arkansas" ready for commission at the present time, there would not be a dock at an American navy yard wide enough to accommodate them. This situation,

however, will be met before those ships are completed by the new docks at New York, Pearl Harbor and Puget Sound, and the enlarged dock at Norfolk. These docks will be able to receive any ship built, building or designed for the United States navy. The Norfolk dock will be completed by September; the New York, February 7, 1912; Puget Sound, March 2, 1912, and Pearl Harbor, May 22, 1913.

DYNAMITING A FLOUR MILL

To make way for a new line of levee that is to protect New Orleans from the Mississippi River it was found necessary to demolish a concrete flour mill built of reinforced concrete. After paying \$108,000 for the mill property, the levee board had to pay \$8,300 to have the mill demolished. Bids were called for to do the work, but so solidly was the building constructed that few contractors would undertake the job.



Concrete Flour Mill at New Orleans, Which was Wrecked with Dynamite at a Total Cost of \$8,300 to Make Way for New Levee

The bid of \$8,300 was the lowest, the next lowest being \$15,000. To demolish the building the contractor was compelled to use dynamite, and to avoid injury to surrounding property very small charges were used, so small, that the contractor declared the dynamite caps cost more than the dynamite. By successive stages from roof to ground the building was

gradually demolished, the work requiring several months. The contractor disposed of many of the blocks of concrete that were blasted off, to the United States government to be used to weight down willow mattresses which protect the banks of the river from caving. Some of the material he sold to steamship companies for ballast.

OKLAHOMA POSTOFFICE MADE OF PIANO BOX

Old piano boxes find a multitude of uses, but probably one of the strangest is that to which it has been put in Oklahoma, where one is utilized as a post-office, by simply setting it up on end.

According to the French scientific magazine "La Nature," there are 113 electric furnaces for the production of steel at present in operation in different parts of the world. Germany has 28, France 22, Norway 13, Italy 10, the United States 8, and England 5.



ENGLISH REGARD CANAL PURCHASE A BARGAIN

That the United States bought the Panama Canal at bargain-counter rates; that instead of being called upon to pay more than it was worth, the government of this country actually paid \$2,705,580.80 (577,280 pounds sterling) less than the inventory of the French possessions shows them to be worth, is the remarkable statement made editorially in *The Engineer*, the leading publication in Great Britain on engineering subjects. The editorial in question discusses the report recently made by a committee appointed by Colonel Goethals to examine the material that came into the possession of the United States at the time of the purchase of the canal and make some determination of its value for the purpose of arriving at an estimate of just how much of an overvaluation, if any, was contained in the final contract entered into between the United States government and the French company that controlled the canal property and franchise. The editor of *The Engineer* discusses at length the detailed report of the committee showing that the sum of 8,247,422 pounds sterling (\$40,072,460.92) was paid by the United States government for the canal, which is just \$2,705,580.80 less than the new estimate of the value of the property, etc. The comment of the English editor on the sale is extremely interesting as the opinion of an entirely disinterested party viewing the matter simply in the light of a great engineering project. He thus expresses himself:

"Of all questions of contemporary interest, the canal enterprise is the one which offers to the press of the United States the most legitimate opportunity for national glorification. Yet for years its management has been a conspicuous object 'on the other side' of violent abuse or systematic silence. During the earlier period of the American occupation of the Zone no occasion was neglected by the more ignoble section of the press to animadvert upon

every real or imaginary fault of omission or commission in respect of canal administration. The criticisms, however ludicrous, or however palpably inspired by dubious motives, of any man or woman who had spent a few hours in the Isthmus, were received with delight, and spread broadcast, embellished with the most pronounced 'scare-heads' obtainable from the type room. No undertaking of such magnitude as the Panama Canal can be conducted without the commission of errors; and that these, when discovered, should be frankly admitted has long been an accepted principle of the officials responsible for the work. For their sake, and in justice to the Washington administration, it should be recognized abroad, if not at home—owing to the exigencies of political partisanship—that few American enterprises have been more conspicuous for freedom from 'graft.' It is because of this and because removed from political influences that the management of the undertaking finds such scant favor among certain sections of Americans. Even the better class of journals, technical no less than general, are not altogether exempt from criticism, in that they have permitted adherence to the principle of private contract and repugnance to army control to rise superior to recognition of a possibly unpleasant truth—namely, that by no other means than government by the military engineers could political and other corruptions have been effectually driven from the Canal Zone. The issue of the report, to which attention has been drawn, will not have been in vain if it serves to remind even a small section of the American people that much of the success which has attended recent work in Panama may be attributed directly to the operations of the pioneer canal builders, to the lessons learned from the failures of the latter, and to the remarkable bargain, of the value of which official confession has now been made."



Great County Hospital to be Erected in Chicago at a Cost of \$3,000,000

NEW \$3,000,000 HOSPITAL FOR CHICAGO

Plans have been drawn by the Cook County architects for a new Chicago hospital which will cost \$3,000,000. These plans provide for a modern fire-proof building, designed especially for the care of surgical patients, of which it will accommodate 1,300, but the complete scheme, of which this is but a part, contemplates the erection of a similar building immediately south for the accommodation of 1,500 medical patients.

The principal feature of the entire hospital will be the ninth or operation-

room floor. Here will be seven operating rooms and two amphitheatres, the latter extending above the roof. Each of the seven operating rooms will be 17 ft. wide, 22 ft. long and 18 ft. high, complete within itself, with etherizing room attached. The north wall of each operating room will be almost entirely of glass, which will afford excellent light. Other features are the four roof gardens, and the large open-air porches extending along the south side of the main building and between each of the 28 ward units.

UNUSUAL TASK FOR AUTO TRUCK

When a bronze group, which was cast in Paris for one of the public parks of the city of Nantes and weighs $3\frac{1}{2}$ tons, was to be transported to its destination, 246 miles distant, it was found that its height of $17\frac{3}{4}$ ft. prevented its being carried either by rail or on a canal barge, the canals being spanned by many low bridges; but an auto truck successfully performed the task that neither of the older types of carriers could undertake, in $3\frac{1}{2}$ days, and without the slightest mishap.



Bronze Animal Group Transported 246 Miles on Auto Truck

TYPEWRITER FOR THE BLIND

The idea of constructing a writing machine for the blind is not a new one, for already, in 1808, an Italian is on record as having built such a machine for the use of the blind daughter of a friend, and, in 1842, a Frenchman, born blind, made a very ingenious typewriter for his own use, in which were found many features generally adopted in modern typewriter construction. But since that time inventors seem to have been too absorbed in its improvement for business purposes to give thought to this special field.

Quite recently, however, a French inventor, M. A. Cayzergues, himself



Each Key Actuates Two Hammers, One Printing Braille Type in Relief, and the Other, Ordinary Type

once temporarily stricken by blindness, which affliction no doubt furnished the incentive for his achievement, has constructed and exhibited, in Paris, a typewriter, which seems to meet in an ingenious way all the requirements of such a machine for the blind.

The keys carry in relief the characters of the Braille alphabet. The pressing down of the key operates a lever which, in this machine, actuates two hammers, one printing Braille type in relief on the first roll; the other, the corresponding ordinary type on the second roll. Spacing between words and lines, and shifting of the carriage, when a full line is written, are accom-

plished as in the ordinary typewriter, and the two carriages are so connected that both move simultaneously. The machine is also provided with a device enabling the blind operator to compare his writing with the copy, while working; and either carriage can be uncoupled, so that only Braille type or ordinary type is printed.

BURN TWO BILLIONS IN BONDS TO SAVE COAL

The government recently saved the price of two tons of soft coal by burning \$2,000,000,000 worth of bonds. The saving was real because the bonds

were old ones which had been redeemed. It became the duty of the committee of the Treasury having charge of the destruction of old currency to do away with this enormous amount of securities. They were sent to the basement where the great macerator cuts to pieces worn out money. They were dumped into the machine but the usual maceration did not follow. The paper of which the bonds—old issues of war days—were made was too tough for the

knives and there was no maceration. The committee is a resourceful one and in a short time the bonds were loaded on a big van, duly guarded and sent to the Bureau of Engraving and Printing. There they were sent to the boiler room and burned. The expert engineer in charge is fond of figures, and it was he who found that two tons of coal had been saved by burning the bonds.

Among the items on the shopping list of the Begum of Bhopal, an Indian princess, in Geneva, Switzerland, was a little matter of 4,022 gold and silver watches, which she purchased recently to take back to India.

COMPLETION OF THE ELIZABETH TUNNEL

By BURT A. HEINLY

One of the interesting engineering incidents of the present year is the completion of the Elizabeth Tunnel, situated 60 miles northwest of Los Angeles, California, and which was driven a distance of 26,870 ft. through the crest of the Sierra Madre mountain range in 1,240 working days. This is a year in advance of the estimate of time required for the work. The opening up of this tunnel is the most important factor in the construction of the Los Angeles aqueduct which was described at length in *Popular Mechanics*, January, 1910.

The Gunnison tunnel is 30,000 ft. in length and the longest water tunnel in the United States; the Elizabeth tunnel, 26,870 ft., ranks second; then comes the famous Sutro tunnel, four miles long, which was built in the late eighties to drain the Comstock mines.

The Elizabeth tunnel has a capacity

of 600,000,000 gal. per day and a grade of one foot to the thousand, so that the inlet is about 26.9 ft. higher than the outlet. When the concrete is placed, the tunnel will be 9 ft. 6 in. wide and 10 ft. 10 in. high. It has been constructed through a solid mountain of granite and more than 500,000 lb. of gelatine dynamite was used in the excavation. One of the features of the work is that the tunnel is excavated directly beneath Hughes Lake, a small sheet of water cradled in the Elizabeth Valley, 350 ft. above the roof of the big bore.

Once started, the work was carried on from both sides of the range without intermission, 24 hours a day. On the south side, little water was encountered, and the up-grade of the tunnel afforded a gravity drainage to the mouth, but the miners drilling from the north portal, on several occasions



Interior of Elizabeth Tunnel—Speck of White in Center is Entrance, Two Miles Away

were forced to flee for their lives when water pockets were broken into and the tunnel flooded within a few minutes.

The two tunnel gangs which had been working toward each other since early in October, 1907, broke the rocky wall that separated them at a point 65 ft. north of the middle of the tunnel; the north portal crews having driven 13,370 ft. and the south portal men, 13,500 ft.

To show the precision with which it is possible to drive a tunnel sheer through the heart of a mountain range, two days later when the observations were made and checked, it was found that the tunnels came within $1\frac{1}{8}$ in.

MOTION PICTURES OF STUMP BLASTING

The irresistible appeal of the motion picture and its possibilities are securing added recognition for the industry every day and new uses for it are being constantly brought forward. For several years it has been utilized for ad-



Sections of Film Showing Preparation of Charge and Blasting of Stump

of meeting (alinement), and that the grade of the north portal tunnel was $\frac{5}{8}$ in. higher than the south—differences so slight as to be indiscernible without the use of instruments.

The miners worked in three shifts of eight hours each with 20 men to the shift. The boring was done with compressed-air drills and the tunnel was lighted with electricity which served also as the motive power for railways that hauled the muck to the dump and the men to and from their work.

The tunnel was driven at a cost of \$44.80 per foot or a total of \$1,208,340. The concrete now being placed has a thickness of 8 in.

vertising purposes. A western electric light and power company has been giving exhibitions showing, in story, the utility and practicability of using electric devices for the home, and a powder company recently staged exhibitions of stump and boulder blasting, ditching, tree planting and hardpan breaking by dynamite under the supervision of a government expert.

ARTIFICIAL-WOOD MATCHES

Artificial wood for matches, composed of straw or dried grass, is now being experimented with in England. The straw is passed longitudinally through a pair of crushing rolls, and then between a pair of cylindrical cutters which divide the flattened straws into strips. The surfaces of the cutters are deeply serrated, and are placed together so that the groove of one cutter receives the raised ring of the other. The strips, supplied with an adhesive, are then fed to a traveling band, and are inclosed on top and underneath with layers of paper. The layers of straw and paper pass through rolls under pressure, between a pair of chains, the links of which form metal molds and are constructed with longitudinal grooves, the edges of which meet opposite one another. The molds so formed are heated, and press the straws together for a sufficient time for

the adhesive to harden. After passing between the chains the straw and paper issue in the form of a layer of round splints, which, after being cut to the required lengths, are dipped into the ignitable composition.

The process is claimed to show considerable economy as compared with the cost of wood and the methods at present employed in working it into match splints.

AUTOMATIC SIDE-SHIFTING STREET-CAR FENDER

A side-shifting spring net and automatic trip fender for street cars has been tested out on the Portland, Oregon, street railways. The fender swings any person or object it comes in contact with to one side of the track.



A Fender That Swings the Object It Strikes to One Side and Allows the Car to Run By

It is claimed that this fender was the only one of the number tested out to be favored by the fender committee of the Portland city council.

AUTOMOBILE WHEEL AS CHANDELIER

An appropriate chandelier for automobile clubs and other places where the automobile plays a prominent part may be formed of an automobile wheel. Such a chandelier, in the salesroom of an automobile concern at Aberdeen, South Dakota, is shown in the illustration. The tire is left on the wheel, and



Automobile-Wheel Chandelier is Appropriate for Automobile Clubs and Salesrooms

the four chains, holding it suspended, are bolted through the rim. A lamp fixture is suspended from the ends of each of these chains, and a fifth is hung from the hub.

OLD PUNISHMENT FOR DRUNKARDS

Not more than a hundred or so years ago drunkards were sometimes punished in England in the manner shown in the illustration. The stock is most appropriately shaped like an old wine cask, and in it the offender was placed with only his head protrud-

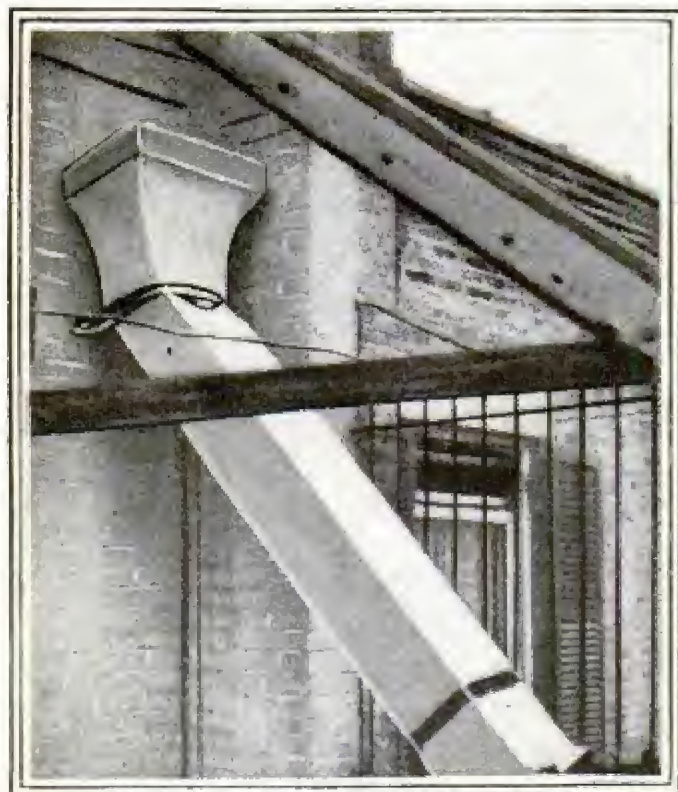


Old English Punishment for Drunkenness

ing through the top. The imprisonment always took place in the public square of the town, where the offender would be at the mercy of the small boy and subjected to the ridicule of his friends.

A NON-FREEZING WATER- SPOUT

A New York property owner, being annoyed frequently by the bursting, during the cold season, of a conductor



An Exceptionally Large Waterspout Constructed to Avoid Freezing Troubles

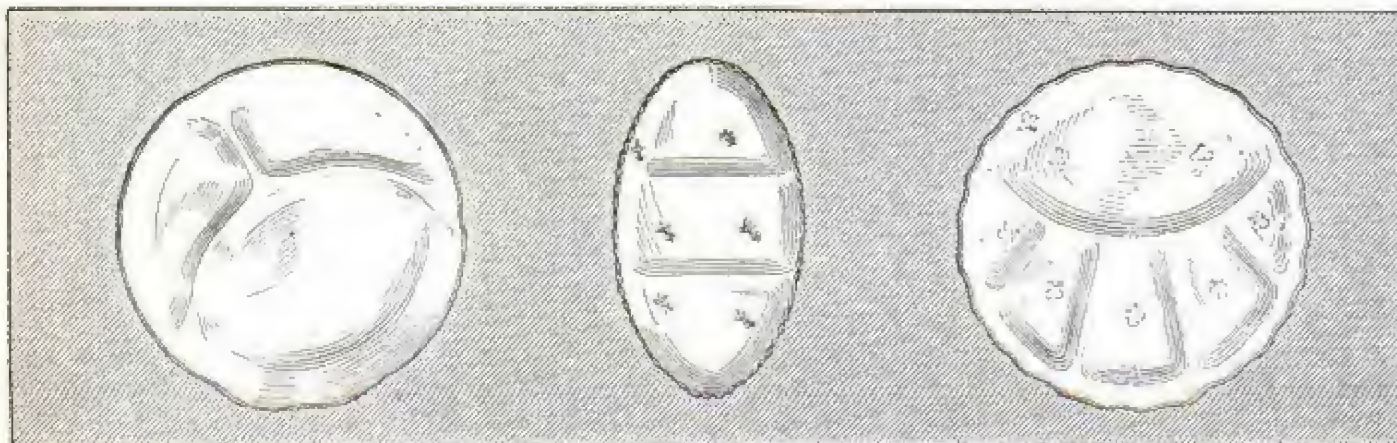
pipe from the roof, had a spout made so large that, under ordinary circumstances, it would never fill with ice, and in this way avoided further trouble.

The old-fashioned round conductor pipes frequently burst, because the water that results from the bright noonday sun enters a down spout on the shady side of a building, where the temperature may be below the freezing point. If the water freezes, the expansion bursts the pipe. With a pipe of the size adopted by the New Yorker, there is generally more than enough room for freezing and expansion.

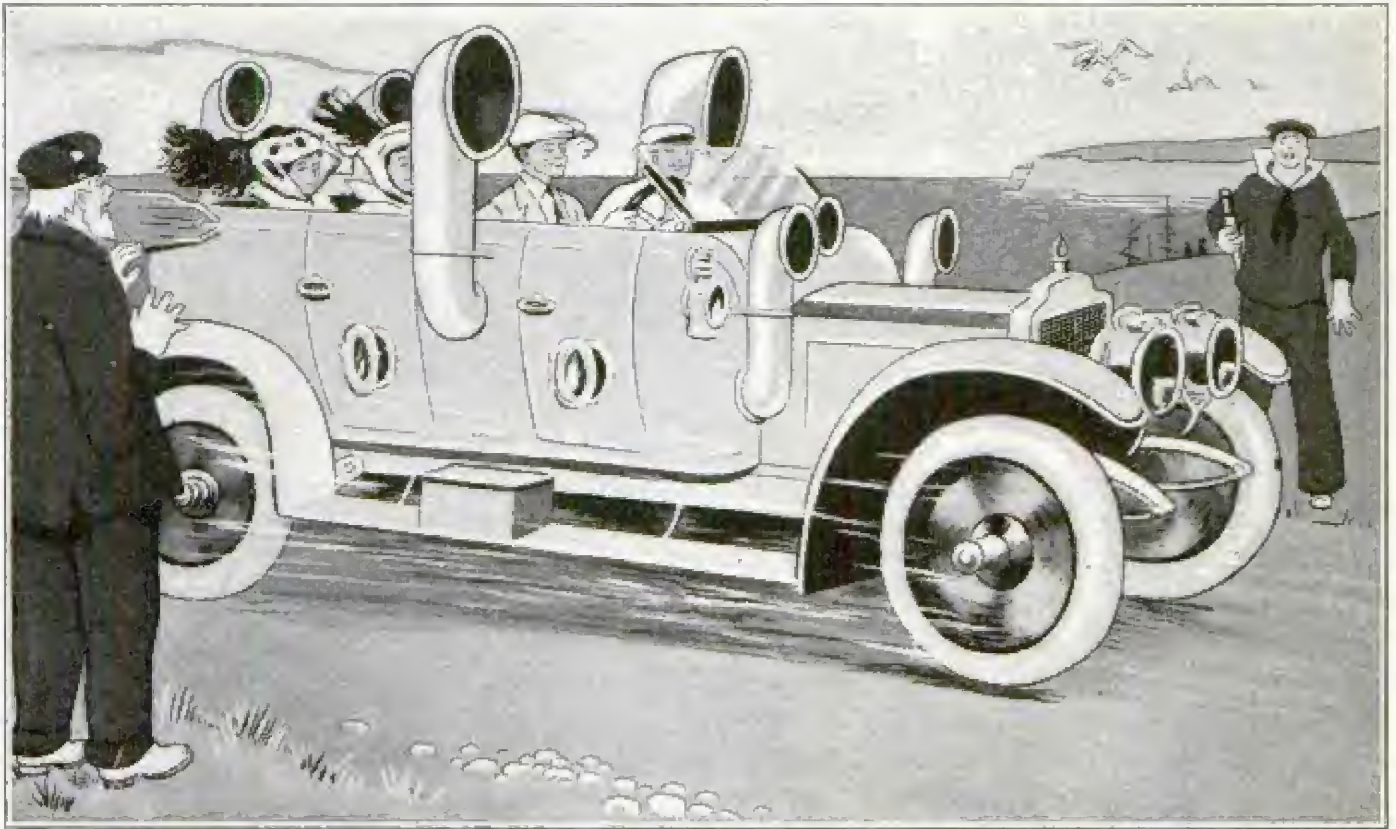
COMPARTMENT PLATES FOR QUICK LUNCHES

Compartment plates are being recommended for restaurants of the "quick-lunch" order and of the kind where the patron waits upon himself. It is practically impossible to place several articles of food on one ordinary plate without having them run together, and every extra plate means extra time required for serving, and very often an extra trip to the food counter if the patron is serving himself.

In the illustrations are shown three, and six-compartment plates, on which meat, potatoes, and from one to three or four side dishes of vegetables, relishes, etc., may be placed without the whole forming a messy conglomeration. The round plates are 12 $\frac{1}{4}$ and 13 $\frac{1}{2}$ in. in diameter, and the oval dish, 11 in. long. Division into compartments is effected by a series of elevations just high enough to prevent the different articles of food from over-running their boundaries.



Three and Six-Compartment Plates for "Quick-Lunch" Service



Ship Ventilators and Open Port Holes are Suggested by an Artist of the London Motor, as a Means of Making the Occupants of Torpedo-Bodied Automobiles Comfortable during Hot Weather

A VACUUM CLEANER FOR LIBRARY BOOKS

By ROY O. RANDALL

If you had a quarter of a million books of all sizes and all kinds of bindings and if all these books and the shelves upon which they were placed were covered with dust, how would you go about it to clean them?

Unless you had heard of the latest improved device for cleaning library books you probably would resort to the same old-fashioned means employed by the John Crerar Library of Chicago before its burden of cleaning was immediately lightened by the adoption of a portable vacuum cleaner.

The old methods of cleaning books and shelves in the vast libraries of large cities were crude and tedious. This is the way the Crerar did the work in "the good old days." A dry-goods box was mounted on wheels and its top covered with oilcloth. Into this receptacle a handful of books was placed and the dust shaken from them after which they were wiped with a cloth. The operation was repeated



Dusting Books on Library Shelves by Means of Vacuum Machine

with the next batch until the entire lot of books was cleaned. This was a slow and laborious process and when the Crerar library possessed only 150,000 volumes it was impossible to go over the entire collection of books oftener than twice a year. Two men were required for the work. Now the same two employes are enabled, with the aid of the vacuum cleaning machine, to clean the entire library of 275,000 volumes in one-third of the time required, under the old system, for cleaning little more than half that number of books.

Vacuum cleaning apparatus, as everyone knows, has come into common use for almost every conceivable work of cleaning. It was not until a comparatively short time ago, however, that the device shown herewith was perfected and put into use. In fact, this book-cleaning invention was manufactured especially for the library which has found it so effective.

Manifold advantages inhere in the new invention. Not only is there the great saving of time in doing the work of keeping books and shelves clean, but the use of the machine permits of the task being accomplished more thoroughly and in a sanitary manner.

When it is desired only to clean the

tops and backs of the books the machine is handled by one man. Two of the attachments shown in the illustration are used—the large, funnel-shaped suction pipe and the small, curved tube which is called the blower. The latter dislodges the dust from the tops and backs of the books so that it is readily caught by the suction pipe and passed through to the receiving can in the interior of the cabinet. When both the books and shelves are to be cleaned, two men are required, one to remove the books from the shelves while the other operates the cleaner. The pump is operated by electricity, connection being made with the ordinary incandescent lamp socket.

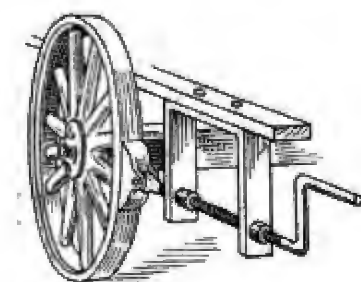
Proof of the efficiency of the machine is found in the fact that 10 gal. of dust were removed from the receiving can after the library had been completely cleaned. This was accomplished without the raising of dust and with little or no disturbance to the workers and visitors in the library. With the blower and suction pipe, the entire collection of books can be gone over exteriorly by one man in five weeks, working five hours a day. Two men operating the blower, suction pipe and shelf brush can thoroughly clean the entire library in eight or nine weeks.

LOGGERS OPERATE TRUCK BRAKE WITH CRANK

A curious brake is used on logging trucks in Switzerland, which, while effective, makes each truck require the

services of two men, one to operate the brake and one to drive the horses. The brake is set on the rear of the rear wheel and

consists of a threaded bar running back from the brake shoe, through a threaded hanger fastened rigidly to the truck frame, to a crank handle. The



man who operates the brake walks in the rear of the wagon and when it is necessary to set the brake, merely turns the crank. This forces the brake shoe against the tire of the wheel and furnishes an effective check.

TWO SEVERE RAILROAD TESTS

Two unique tests were made recently by officials of an eastern railroad at the company's testing laboratory at Altoona, Pa. In the first place, the officials wanted to know whether or not their new steel passenger cars were as fireproof as boasted. In one end of a car there were placed 150 lb. of kindling wood, carefully dried, and several tanks of oil. These were ignited,



Combustible Material Being Burned in All-Steel Car to Show Its Fireproof Nature

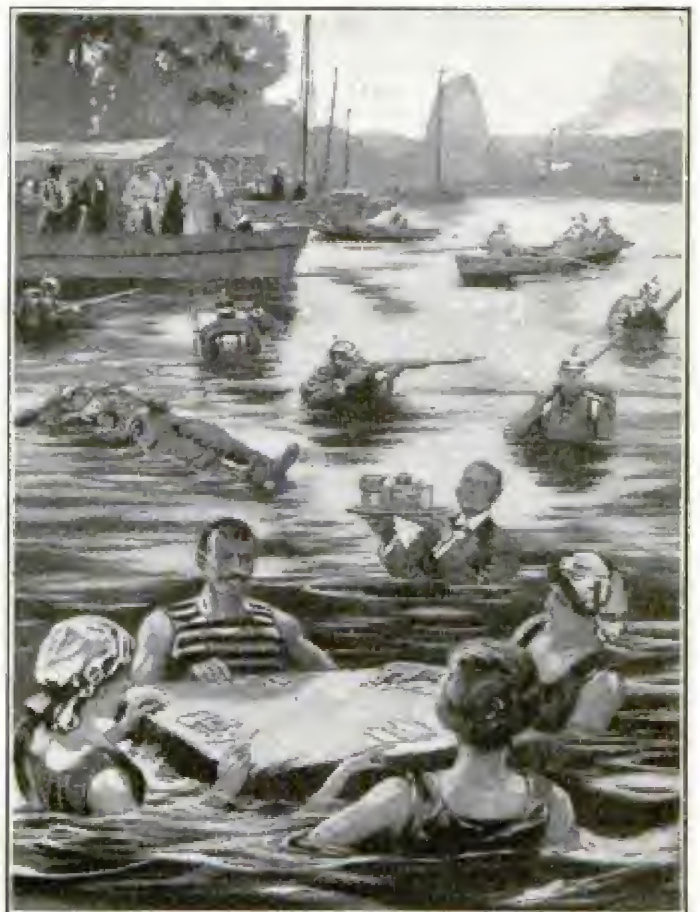
but, though the flames and smoke issued from every window, when the fire had burned itself out it was found that it had not spread from where it had started and that a new composition ceiling lining had not been even charred.

The other test was to see how heavy a train could be moved, and in this a new record was established. One of the company's big moguls was hitched to 120 steel gondola cars, loaded with 6,450 tons of coal, and it moved off with them for a distance of 127 miles as though it were all in the day's work. A speed of 13 miles an hour was maintained during the run. The train measured 4,888 ft. in length, a little more than 9/10 of a mile, and the entire load, including equipment, weighed 16,888,000 lb.

CLOTHES THAT MAKE THE WEARERS NON-SINKABLE

A German engineer is claimed to have invented a new fabric designed to make clothing so buoyant that it will keep the wearer afloat in the water. The composition of the invention which brings about this result is said to be a well-guarded secret, but a remarkable demonstration of it given recently in the Spree, near Berlin, seems to prove that the wearer of a garment lined with it becomes unsinkable.

In this demonstration, German infantrymen, in full marching kit, clad in uniforms lined with the material, threw themselves into the water, and not only did not sink, but were able to assume standing position and fire. At the same time, another party played cards on a floating table and were served with coffee, both the waiter and the players being clad in the fabric.

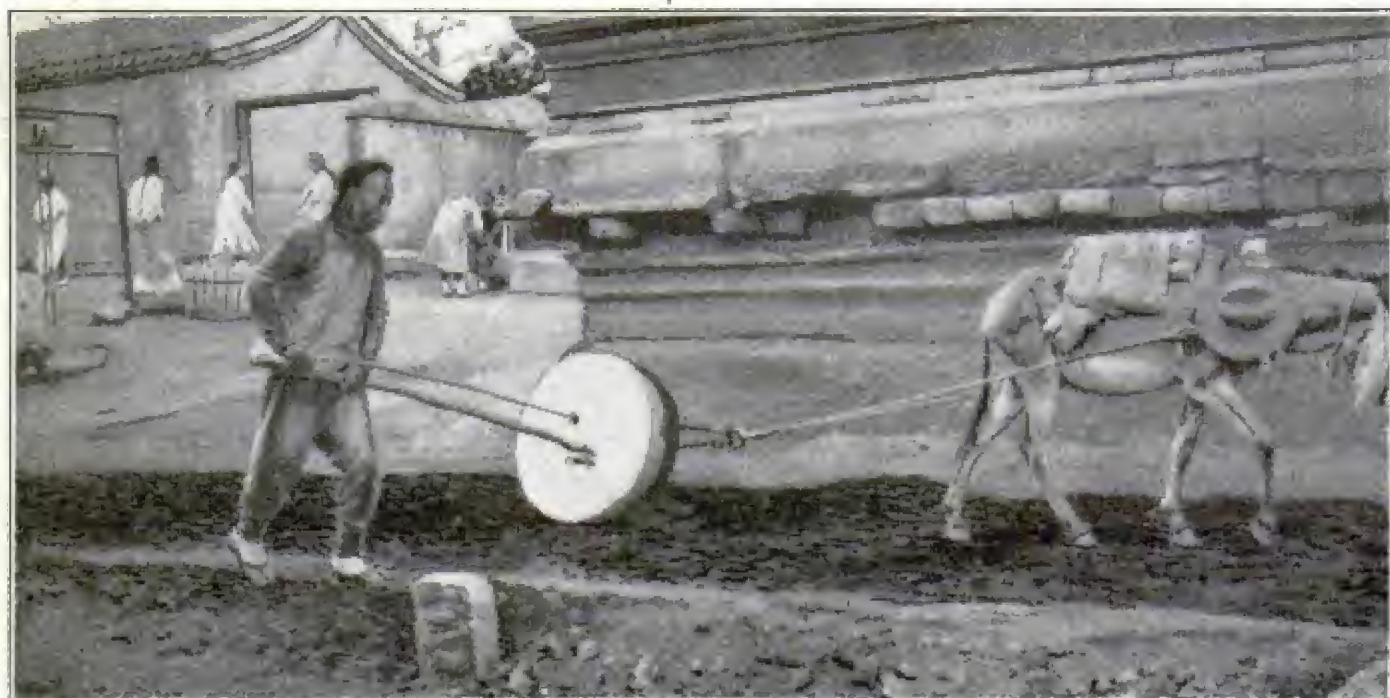


Courtesy Illus. London News
Remarkable Demonstration of a Fabric Which Makes the Wearer Non-Sinkable

Still another report on this supposedly remarkable invention states that the inventor of the fabric recently jumped into the water before the Kaiser's steamer to demonstrate the value of the invention, and that the police arrested him for impropriety.

of patent is that secured by the maker of a sanitary moisture-proof container.

Some time ago the government ruled against the use of animal glue in packages intended to contain food products, on account of the insanitary nature of the material. A practical inventor set



Chinese Method of Delivering a Grindstone

MOVING A GRINDSTONE IN CHINA

A unique method of transporting grindstones, frequently adopted in China, is shown in the accompanying illustration. A long pole is pegged into the hole in the center of the stone and a donkey is harnessed to the short end. The driver then takes hold of the long end of the pole and keeps the stone upright as it is hauled rolling over the ground.

A BASIC PATENT

Since the Selden patent has become famous, the term "basic patent" is frequently encountered. The use of this term is usually incorrect. A basic patent is one which protects the use of a principle, not a modification of a principle, and the principle must be indispensable to the accomplishment of the purpose contemplated. It follows that basic patents are simple. A very good illustration of this type

to work to avoid this obstacle. For the body of the package a sheet of paper was saturated with paraffin and rolled into a cylinder. Paraffin has no adhesive power when warm and little when cold. Consequently the built-up cylinder would not keep together, but would spring open into a loose roll. After exhaustive experiments, a scheme was found which operated satisfactorily. Draw a tough thin piece of paper rapidly across a sharp knife blade so as to scrape, not cut. The strip of paper at once coils closely. This is the basic principle. The sheet of paper to be formed into a package is drawn quickly over a sharp steel edge, then through a bath of paraffin—then rolled to the required diameter. The tendency of the paper is to roll closer and not open up and the top and bottom can be immediately inserted and the package shipped. This scraping process has been pronounced by the very highest authorities as a basic principle. The invention has opened up a new field for the wax and paper



The Actual Moving of This Railroad Bridge and Substitution of the New Took but 49 Seconds

container and is sanitary in the fullest sense of the term. The package holds liquids indefinitely and perfectly and can be shipped with the same facility as the tin can and the glass bottle.

REPLACE OLD BRIDGE BY NEW IN 49 SECONDS

With the idea of increasing the capacity of the Boston & Albany Railroad, that road has recently replaced all of the old bridges between Boston and Albany with heavier structures that would stand without danger the increased traffic. In all, 20 bridges, weighing hundreds of tons, have been replaced, the continuous tracks of which, if placed in a straight line, would extend nearly a mile. One of the most remarkable bridge-replacement feats was carried through at Huntington, Mass., over the Westfield River. The old bridge consisted of three spans with a total length of 294 ft. The new structure, which was of heavy plate

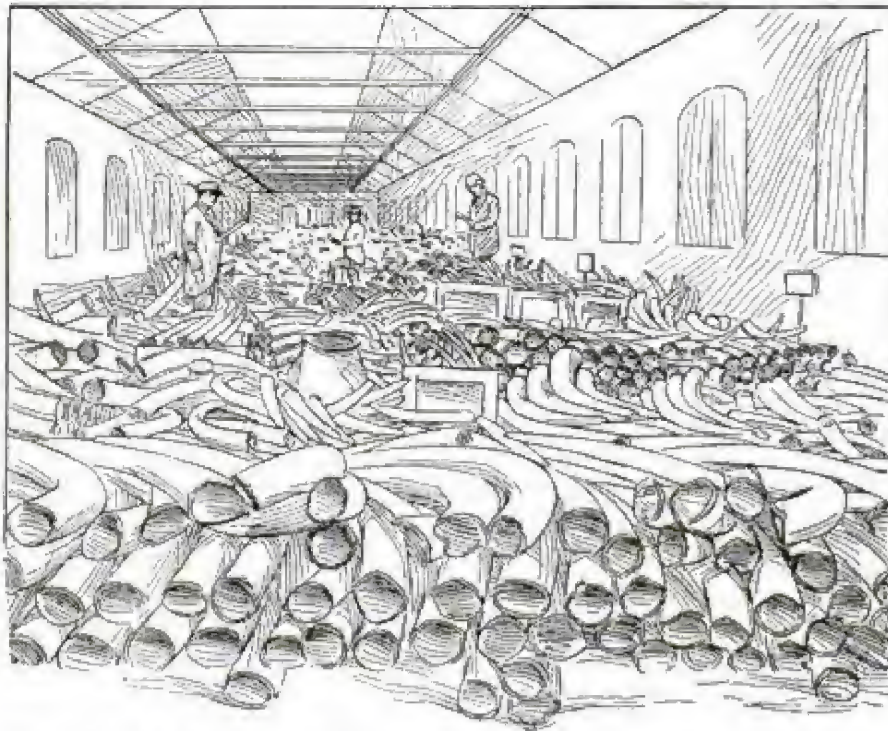
girders, was erected by the side of the old truss bridge, and a number of sets of steel rollers in racks placed on piling allowed a set of powerful steam derricks to slide the new bridge out and the new structure into its place at the same instant, which was done in the short time of 49 seconds. This is most remarkable, as the new bridge weighed 1,000 tons and it had to be moved a total distance of 45 ft. to the new position. It required the stoppage of traffic for only the short space of 1 hr. 40 min. to carry through the work of completing the abutments and putting the division once more on its regular schedule of trains.

A railroad company plans to install several moving-picture machines on trains engaged in the transcontinental service to relieve the monotony of the long cross-country journey and at the same time instruct the passengers in the wonders and resources of the country through which they are passing.



The New Bridge Substituted for the Old in 49 Seconds, the Old Bridge Being Slid Out and the New One into Position in the Same Minute

A RECORD SALE OF IVORY



Elephant Tusks Littering the Floor of a London Warehouse during a Record Sale

The periodical sales of ivory at the London docks always arouse much interest owing to the fact that ivory becomes more difficult to procure year by year as the elephant becomes rarer. The illustration shows a record supply of tusks completely covering the floor of a large London warehouse.

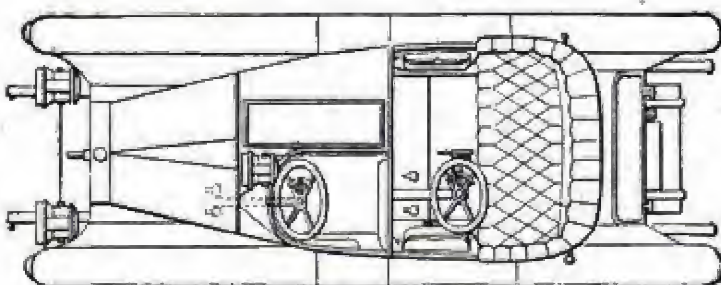
¶The concrete floor of the bridge recently completed across the Missouri River at Kansas City is 5,998 ft. long, and is claimed to be the longest concrete floor in the world.

DUAL-CONTROL AUTOMOBILE

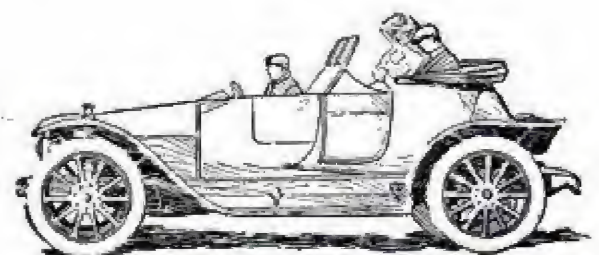
A new type of automobile-body construction, in which the driver's seat is a veritable pit, and the rear seat is provided with controls so that the owner may enjoy driving the car without leaving his seat or disturbing the chauffeur, has been designed.

It is almost universally conceded that, in the present type of body, the best seat in the car is that occupied normally by the chauffeur, while the owner of the car and his family or friends are relegated to back seats with an obstructed outlook and many other disadvantages. In this new design the driving seat is considerably lowered in relation to the rear seats and brought

so close to the dash and so low down that it becomes a pit seat. It is only wide enough to accommodate the chauffeur alone, and the space beside him is utilized for small baggage. This disposition of the front part of the body increases the body space proper, the owner and his friends are brought further forward than in the usual body, and, as the seats are higher, they have an unobstructed view over the chauffeur's head. The wind screen is mounted back of the driver's pit, and the dual control gives the owner the option of allowing the chauffeur to drive from the pit or of driving himself from his seat in the back.



Arrangement of Driver's Seat and the Dual-Control System



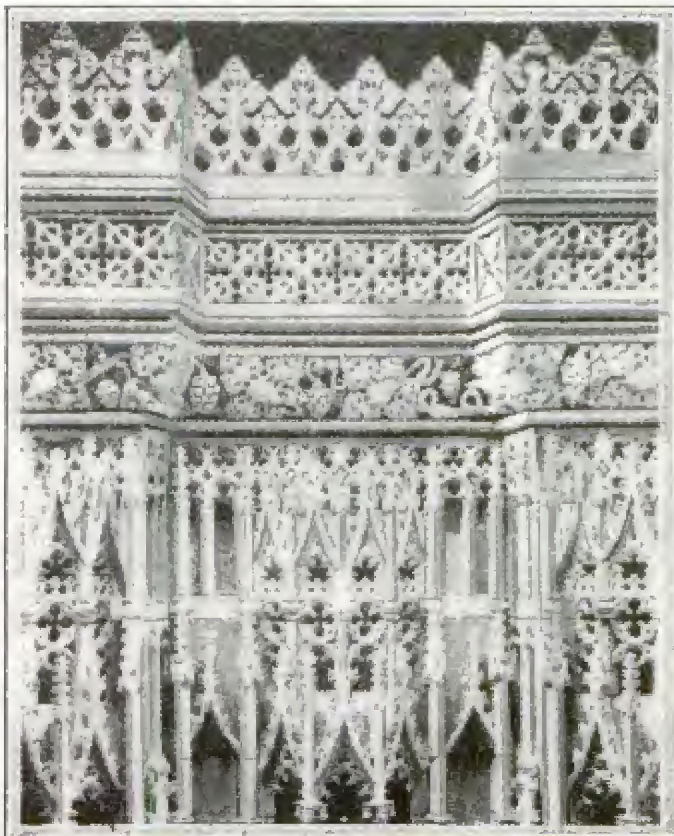
Side View of the Dual-Control Automobile

The dual control is simple in operation. Folded up vertically against the partition in front of the owner is a second steering column, with the wheel held flat against it on a pivot. By pulling back the column and locking the wheel in position, control of the steering is automatically taken away from the chauffeur, and the duplicate set of side levers gives the owner complete control over the gears and brakes.

COLOSSAL REREDOS FOR AN AMERICAN CHURCH

A wonderful marble reredos, said to be the largest and most ornate Gothic work executed since the Middle Ages, was recently completed at Exeter, Eng., for Christ Church cathedral, St. Louis, Mo. Although executed in England, it was designed by American architects.

The whole structure, nearly 40 ft. high, weighs 300 tons, and in addition to the carving of the intricate design and large sculptured groups there are about 60 figures, a great number of which are life-size. The illustration gives an idea of the lace-like carving.



Part of the Upper Portion of the Reredos for Christ Church Cathedral, St. Louis

TREE MAKES RAILROAD CURVE ITS LINE

The railroad recently built through the Cahuenga Pass in California was forced to make a slight detour at one



A Railroad was Compelled to Curve Its Line to Save This Tree

point because the government refused to allow an old sycamore tree to be cut down. This tree was used as a starting point in running government surveys in the early days of California. As the photograph shows, the tree is right in the way of the tracks.

U. S. WARSHIPS TO HAVE INCINERATORS

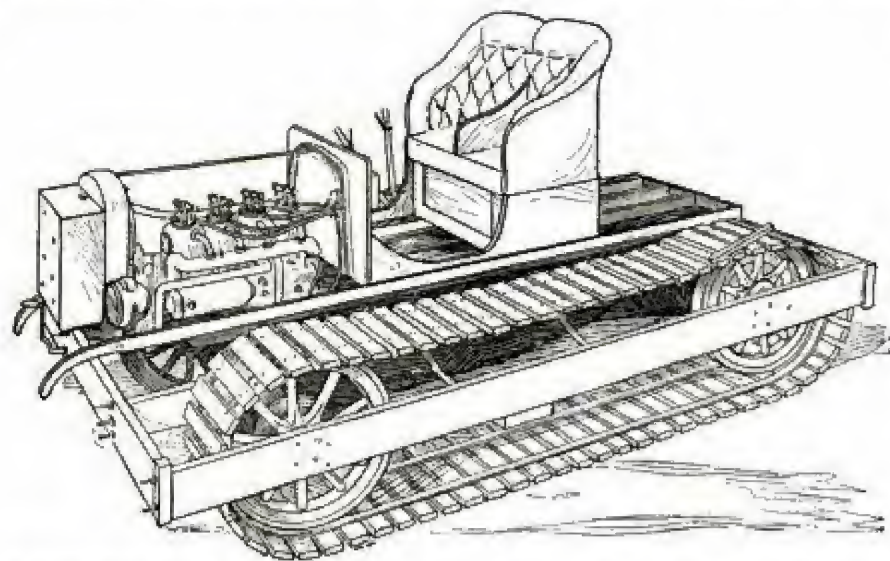
Owing to the fact that the litter refuse thrown from a battleship provide a trail by means of which enemy may ascertain the direction it is taking, the Navy Department proposes to install incinerators on its ships. During the world-girdling cruise of the battleship fleet, the slower service ships reported that they had no difficulty in trailing the fighters by the litter which floated for miles in the wake. Incinerators are now used on British warships.

⌘The fastest train in Germany makes an average of 55 miles an hour on 135-min. run.

CATERPILLAR AUTOMOBILE FOR ALASKA SNOW

A freight-carrying concern of Candle, Alaska, has installed a cater-

pillar automobile for the transportation of freight over the snow-covered



Automobile for Alaskan Snow Fields Equipped with Endless Chains of Wooden Treads in Place of Automobile Wheels

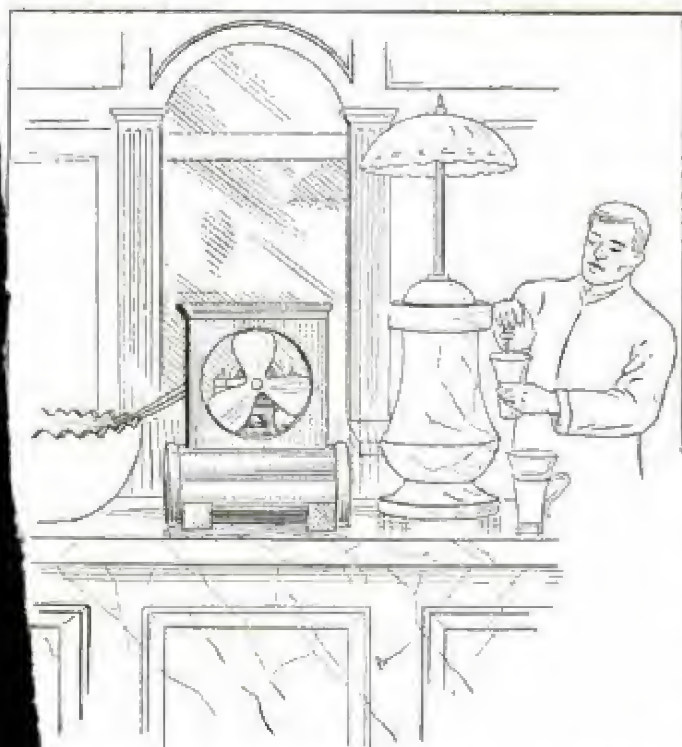
pillar automobile for the transportation of freight over the snow-covered

out from the rear of the car, designed to help in steering it.

ELECTRIC FAN SHOWERS PERFUME

A small electric fan obtaining power from a dry cell contained in its base and designed for spraying the air of banquet halls and similar places with

perfume is shown in the accompanying illustration. The perfume is placed in a receptacle of the apparatus, and the movement of the air generated by the fan serves to distribute its fragrance through a room.



Self-Contained Fan Designed to Distribute Perfume through a Room

NEW MUTE FOR VIOLINS

A new type of violin mute has been invented. Instead of being constructed with prongs fitting over the top of the bridge, the new mute is constructed with two small pads, one fitted on each side of the center of the bridge, and held in place by a spring. The two thin plates to which the pads are attached open and shut like a pair of tongs, and the mute can be adjusted very quickly. It is claimed that this mute does not change the quality of tone, but produces the same quality in reduced volume.

A cargo of 846 tons of dynamite was recently carried to Panama for canal work by the steamship "Alm."

TWO INGENUOUS CLOCKS

Two exceptionally ingenious clocks, both of which were made and are being used in Detroit, Mich., are shown in the accompanying illustration. One of them not only tells the time with precision, but also informs passers-by of the exact hour and minute at which the next interurban electric car will pass the corner at which it is located. To the left and right of the dial are two smaller faces on which cars are illustrated to indicate the direction in which they pass. Above the car on each face numerals appear automatically, giving the hour and minute of the next car. These change to the time of the succeeding car when the hands have passed the hour and minute announced. One of them states, for instance, that "Port Huron car leaves Meier's corner at 2.30." This clock also turns on and shuts off the electric lights in the store where it is displayed, and sets off an alarm in the owner's house at 6.30 each morning. It stands about 4 ft. in height, the framework is of beautifully carved mahogany, and the mechanism is operated by a mercury pendulum



A Clock Which Gives the Time in 13 Cities, Shows the Phases of the Moon, Shows the Month, the Day of the Week, and the Date, and Does Several Other Interesting Things



This Ingenious Clock Tells the Time, Gives the Hour and Minute the Interurban Electric Cars are Scheduled to Pass, Rings an Alarm at 6.30 Each Morning in the Home of Its Owner, and Operates the Store Illumination

containing 44 lb. of mercury in three visible glass jars. The mercury is said to counteract the expansion of the mechanism under all conditions of temperature, keeping the time accurate to the second.

The other clock, while not accomplishing such modern tasks as announcing the time of passing cars, setting off an alarm in the owner's house, etc., does many ingenious things. Around the central dial is a series of small dials giving the exact time in Paris, Berlin, London, Rome, Pekin, St. Petersburg, Manila, San Francisco, New York, Philadelphia, St. Louis, and Washington. The sphere at the top revolves once in 29 days and eight hours, and shows correctly the moon's phases, the representation of the moon being

illuminated. A calendar gives the day of the week, the date, and the month, the changes being made automatically at midnight, and a globe representing the earth makes a revolution every 24 hours. Figures representing men of different nations march across the base

every 10 minutes, accompanied by music; chimes are rung every 15 minutes by characters representing childhood, youth, manhood, and old age, and "Father Time" strikes the hours. This clock is 15 ft. high, 7 ft. wide, and weighs 2,500 lb.

COIFFURE OVER SIX FEET IN HEIGHT

A coiffure, over 6 ft. in height and weighing 10 lb., was recently built up on the head of a Parisian dancer by a

French hairdresser. Despite the size of the head-dress, which was at least a foot taller than herself, the wearer was able to dance.



¶The following news item was received recently by a French newspaper from a subscriber in a quiet little out-of-the-way place: "An aeroplane has been here yesterday again, I am told, and actually

taken several people flying along the shore at 100 francs a person. I send you this piece of news with all reservation, although all here say they can swear to it."

¶At the Southampton (Eng.) naval review, held in connection with the recent coronation of the British king and queen, the total displacement of the fleet amounted to 1,021,510 tons, including 620,700 tons of battleships. The ships, which carried 60,000 officers and men, represented a total cost of about \$500,000,000.

A NEW IDEA IN AUTO AMBULANCES

Dr. Walter S. Goodale of Buffalo, superintendent of the Ernest Wende Hospital for contagious diseases maintained by that city, is the inventor of a new auto ambulance. The new feature of these machines, which on the exterior resemble the familiar type of auto ambulance, is an aluminum shell or case constituting the lining. These cases are very nearly the size of the auto body and are mounted on small wheels with roller bearings. In the garage they are kept in a large steel cabinet, with a compartment for each. These compartments are air-tight and permit the ready and complete fumigation of the cases, after which they can be rolled out into the auto body.

Five of these cases are in use, one each for diphtheria, scarlet fever, measles and erysipelas, and one for all other contagious diseases. With their use it is believed to be almost impossible for a patient suffering from any contagious disease to have his sickness complicated by any other infection.

NEW GERMAN REFRIGERATOR CARS

A new type of refrigerator car, cooled by ammonia refrigerating machines operated by internal-combustion engines using petroleum as fuel, are being built in Germany. The plant is placed in the center of the car, with atmospheric condensers on the roof above. Cylinders beneath the car contain sufficient petroleum for 10 to 12 hours' operation, and water sufficient for 6 to 8 hours.



A Fine 15-Foot Lignite Seam, on the Little Missouri, Near Medora, N. D. Tonnage is Over 17,000,000 per Square Mile

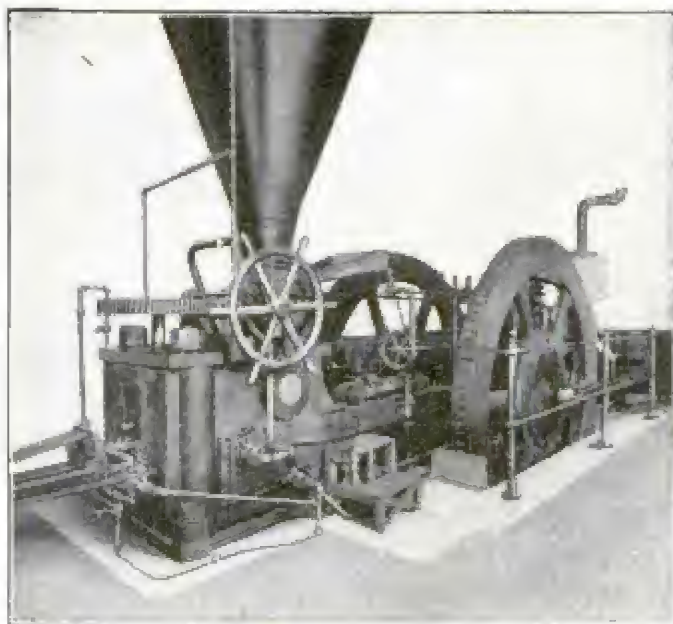
WEALTH IN LIGNITES

Powerful Briquetting Machine Makes Fine Fuel Out of the Poorest of the Coals

By GUY ELLIOTT MITCHELL

Seven hundred and forty billion tons of fuel are deposited in the bosom of the earth, under the United States, principally in the western half, yet hitherto useless except to the farmer who digs out a few loads and burns it in his home. This fuel is a low grade of coal—lignite—the lowest and poorest in heat units, and only a step removed from peat and wood. It has too much moisture to generate steam under a boiler

and will not bear transportation well, since it airslacks and crumbles almost immediately.



German Briquetting Machine. By Enormous Pressure Coal Dust is Made into Hard Fuel

But the U. S. Geological Survey and now the Bureau of Mines have, through experiments at the Pittsburg testing station, succeeded in making the lignite from California, Texas and North Dakota into briquettes without the use of a binding material. The difficulty heretofore with the manufacture of briquettes

has been the cost of the pitch considered necessary to hold the coal dust together. Lignite, however, can be briquetted without binding material—at least this is done with some of the foreign lignites, and there seems no reason why American lignites as well should not make good briquettes. As a matter of fact Germany has for many years made briquettes from her brown coal, which is quite similar to our own lignite.

The Bureau of Mines, sometime ago, conducted a series of experiments at the pumping plant of the Reclamation Service, at Williston, North Dakota, and succeeded in developing a furnace that would burn the lignite satisfactorily. But this did not solve the problem of the transportation of the lignite. The government therefore sent to Germany and obtained from that country a powerful briquetting machine. This machine is a huge affair and simply exerts enormous pressure on the lignite, the constituency of which is such that a solid dense briquette is formed, which makes an admirable fuel. The experiments have gone far enough to indicate that lignite can be satisfactorily briquetted at a cost that makes the manufacture commercially possible.

Charles L. Wright, of the Bureau of Mines, in discussing the experiments said: "The results of the briquetting investigations conducted by the government are expected to prove of considerable value, not only to the govern-

ment itself as the owner of extensive lignite deposits in her public lands, and the largest single purchaser of fuel, but also to the people of the regions where lignite is found. The problem of a fuel supply in those regions is of peculiar interest, for many of the lignite deposits are situated long distances from fields of high-grade coal. The problem assumes still larger proportions when one realizes that the development of manufacturing industries in those regions depends upon the ability to obtain a cheap and satisfactory fuel."

Mr. Wright estimates the cost of briquettes, loaded on cars, from a plant located at the mines, at \$2.51 per ton in Texas; \$3.53, in North Dakota, and \$5.24 in California. This applies to briquetting run-of-mine lignite to improve its heat value and weather-resisting properties rather than to briquetting slack or waste coal. It is believed possible, however, to make briquettes also from the waste coal, which would reduce the cost.

To give an idea of what these experiments may mean to North Dakota, for instance, it may be mentioned that there are an estimated 500,000,000,000 (five hundred billion) tons of lignite in that state alone. As compared with this, the total tonnage estimated for the great coal fields of Pennsylvania, both anthracite and bituminous, is 112,500,000,000. Montana has in the neighborhood of 303,000,000,000 tons of lignite, and Texas, 23,000,000,000 tons.

FENCE MADE OF GUN BARRELS

The old saw "Beating swords into plowshares" is well exemplified in a fence in Washington, D. C., which is made out of gun barrels. Careful examination of the iron uprights of the fence, which stands in front of three of the oldest houses in historic Georgetown, will show small projections from each one.

When Washington was threatened by the invasion of British troops in 1814, the United States government

had not the unlimited financial resources it now possesses, and the authorities appealed for help to the public-spirited citizens. Most of the wealth of the District of Columbia was then centered in Georgetown, as at that time it was one of the most important ports of entry of the southern Atlantic. Merchants of Georgetown did a thriving business in the West India trade, importing molasses, coffee, sugar, and rum in large quantities.



Fence in Washington, D. C., the Uprights of Which Consist of the Barrels of Old Flintlock Rifles. Built Nearly a Century Ago

Among the foremost of these big merchants and landowners was Reuben Daw. He and a number of others immediately advanced money for the defense of the capital, asking no security from their government.

When the war was over the government was nearly bankrupt and was in no position to repay the debts contracted. As a means of recompensing the people who advanced the money without security, it was decided to allow those who so desired to go to the navy yard and take anything in the way of castings that they could use.

Advantage of this opportunity was

taken by Daw, who asked for a consignment of antiquated flintlock muskets which were rusting in a neglected pile in an old warehouse. These were given him and he took them to Georgetown. Removing the stocks from the old guns, he had plates forged at one end and made them into the fence which he placed in front of the houses that he then had under construction. The small projections on each picket are the corroded remains of the sights at the ends of the gun barrels. The barrels are in as good condition today as they were when they were put up.

ARMY SURGEONS SCORE A REAL VICTORY

The work that has been done by the military surgeons at San Antonio, Texas, furnishes the first definite proof of material advance over the system followed in 1898 and the great value to the army of the discovery of the anti-typhoid serum. The big maneuver camp furnished the first opportunity for this sort of work by reason of the fact that it was the first time a large body of troops has been gathered in one camp under anything like the con-

ditions that existed in 1898. The problems the medical men solved at San Antonio were actual, and dealt in none of the fictions the working out of the tactical maneuvers made necessary, because the conditions were precisely similar, the dangers not one whit less, than would meet an army in war time. The victory therefore, was real, not confined in a binding of "ifs," and showed an astonishing advance.

During the months of June, July,

August and September, 1898, there were gathered in camp at Jacksonville, Fla., nine regiments of infantry representing the 2d division of the 7th army corps, these organizations having a total strength of 10,759 men. During this period of four months there were 1,729 actual cases of typhoid fever; 2,693 cases diagnosed as "probable typhoid fever"; 248 deaths from typhoid fever and 281 deaths from all other diseases, making in all a total of 529 deaths.

During the months of March, April, May and June, 1911, there were gathered in camp at San Antonio, Texas, a complete tactical army division containing eight regiments of infantry, two regiments of field artillery, two regiments of cavalry and such engineers, signal corps, etc., as were necessary to complete the organization, an aggregate of 12,801 officers and men. During this period of four months there was one case of typhoid fever and a total of 11 deaths from all causes—but no deaths from typhoid. The non-effective rate—the figure representing the number of men unavailable for duty—for the entire period of four months was 22 per 1,000 for the entire division. The non-effective rate for the entire army in the United States for 1910, housed in barracks and quarters as perfect from a sanitary standpoint as modern construction makes possible, was 34 per 1,000. These figures would seem to need no further explanation, or the conduct of the medical corps no greater praise. However, the

editor of the Journal of the American Medical Association is not content to let the matter rest with the report of Col. Jefferson R. Kean, the chief surgeon of the maneuver division. The Journal states:

"It is clear that the medical officers attribute their triumph over typhoid fever to the method of immunization by the injection of dead cultures of the typhoid bacillus which was introduced into the army two years ago as a voluntary measure, and was for the first time made compulsory when applied to the officers and men of this division. The value of this preventive measure, as well as its innocuousness, has thus been demonstrated conclusively and on a great scale. It would seem, therefore, that the time has come for the medical profession throughout the country to follow the example of the army by making use of the typhoid prophylaxis in general practice. The high degree of efficiency shown by the medical service in the recent mobilization is not fortuitous, but is the fruit of patient, laborious and ably directed efforts to apply the lessons of the Spanish War, and to assure the best results. This efficiency is a legitimate source of pride and satisfaction to the medical profession of the country, and should be a sufficient demonstration to the government of the wisdom of adequate and generous provision for its sanitary service. It is regrettable to read of shortages of officers, of men, and of mules for the sanitary organizations, when only a single division is mobilized."

CONTINUOUS UNLOADER FOR RAILROAD FILLS

A unique continuous car-unloading system in the construction of high railroad embankments or fills, and designed to do away with the high trestles usually necessary in such work, is being used very successfully by a western railroad in California.

The system consists of a circular track, resting on radials and partially

supported by rods, suspended from a mast in the center of the structure. The whole is set on rollers and is moved ahead by its own power as the filling progresses, 10 or 15 ft. at a time. In the center is a double-drum hoisting engine, which operates a cable leading around the circular track. A train of ten or twelve loaded cars is pushed



Unique Continuous Car-Unloader for Railroad Fills, Comprising a Suspended Circular Track around Which the Cars are Run

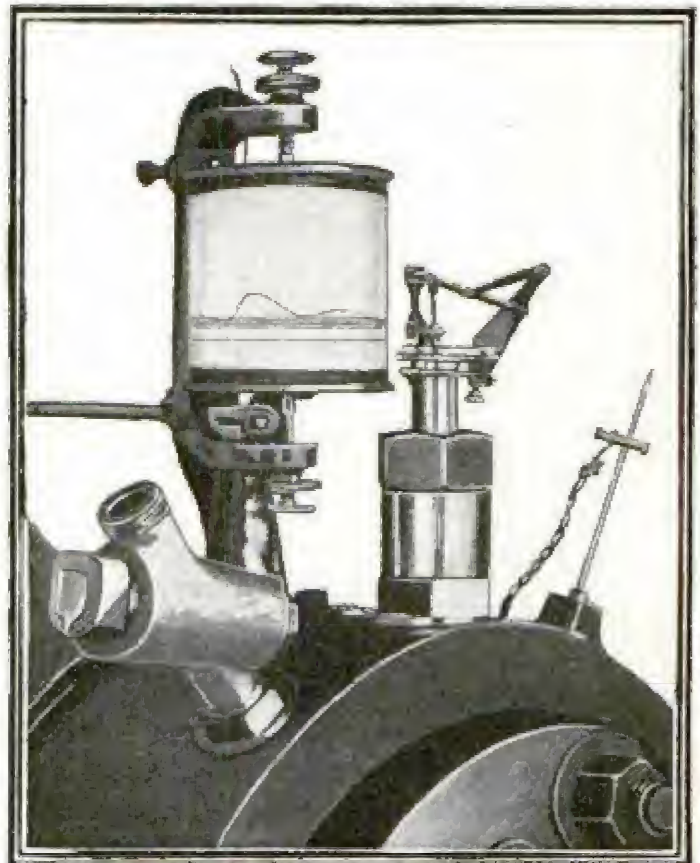
onto the circular track by a locomotive, then the cable picks them up and hauls them around. These cars are of the side-dumping type, and one man with a stick dumps them as fast as they come to him. While the loaded cars are going around the circle and are being dumped, the locomotive switches from the delivery to the receiving track, and is ready for the empties. The empty cars having been delivered to the locomotive, the cable is pulled back and is ready for another train.

Thus the dumping is practically continuous, high temporary trestles are eliminated, and it is claimed that the work is accomplished in less time and at a less cost than by any of the old methods.

PHOTOGRAPHING DURATION OF EXPLOSIONS

A photographic apparatus is being used by the British mine authorities in recording the duration of the flame of bursting explosives, which is necessary in testing the danger of fire-damp. An electric motor makes the film revolve at a high speed, and the explosive,

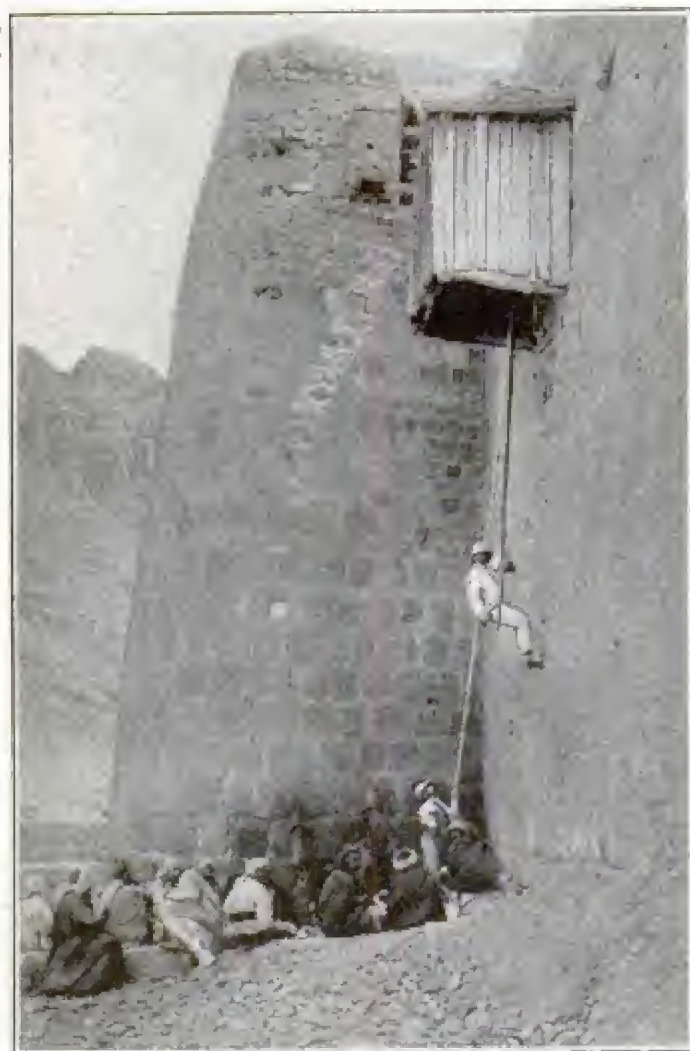
which is placed in a box at the left, is fired by an electric spark. The apparatus is also provided with a device which measures the rapidity of the detonation.



Apparatus for Photographing the Duration of Flame of Bursting Explosives in Securing Data for Prevention of Mine Disasters

THIS MONASTERY MUST BE ENTERED ON A ROPE

The only entrance to the monastery of St. Catherine, on Mount Sinai, is high up in the wall, and the only means



Queer Entrance and Manner of Entering the Monastery of St. Catherine on Mount Sinai

of reaching it is by way of the rope elevator shown. If any monk or visitor wishes to enter, he takes his place at the end of the rope and is pulled up into the hooded entrance.

AUTOMATIC TRAIN-STARTING SIGNAL

Many of the New York subway trains are now equipped with a new automatic train-starting signal which saves many seconds of time in starting a train from the stations. It consists of a complete wire circuit from the door of the last car to an electric signal-lamp in the motorman's compartment

at the head of the train, the wires being easily connected or disconnected between cars. In running the length of the cars the wires are attached to each sliding door, the edge of each door being provided with a copper button which comes in contact with another button on the wall of the car when the door is closed. When all the doors are closed, the circuit is completed and the electric lamp in the motorman's box is illuminated, which is the signal to start the train. Should the light cease to burn, it means that one of the doors has been opened, and is the signal to instantly stop the train wherever it may be at the time.

By this system of starting, it is claimed that from 7 to 10 seconds is saved at each station, which means a saving of several minutes on each run. By the old method, the guard in the last car as soon as he closed the door signaled the guard in the car ahead, and so on until the guard in the first car of the train, having been notified by this succession of signals that all the doors were closed, gave the signal to the motorman.

PHONOGRAPH RECORDS AS LETTERS

A New York business man and his brother in Panama correspond regularly with talking letters in the form of phonograph records, and find the idea far more useful and interesting, and not more costly, than written correspondence. The records go as third-class mail and the same cylinders are used for a long time. After one brother has listened to a communication from the other as often as he wishes, he shaves it off and makes the same record serve for carrying the answer.

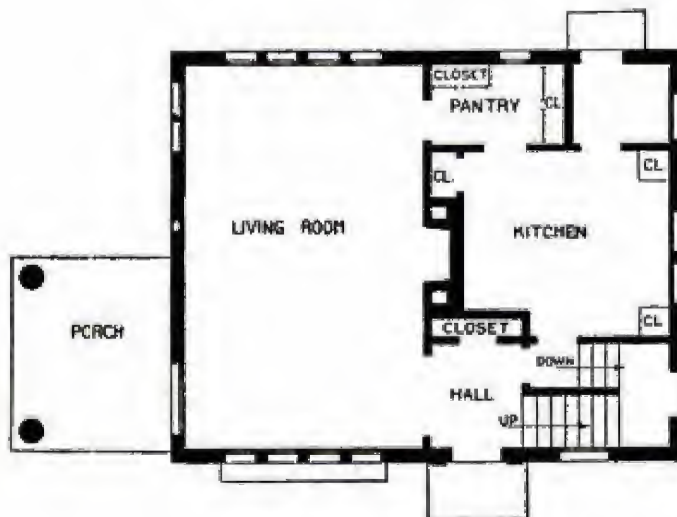
A missionary in the Philippines, desiring to give motion-picture shows in remote districts, equipped the automobile in which he traveled from place to place, with a countershaft which he geared to a small dynamo and thus furnished light for his lantern.

DESIGN FOR A MODERN ENGLISH COTTAGE



Mink & Carson, Architects

Front Elevation of English Cottage Built of Concrete



First-Floor Plan



Second-Floor Plan

An excellent example of the English type is shown in this new cottage design. Concrete is the material of which the walls are constructed, tiling being used for the roof and hardwood on the first-floor finish. The architect estimates the cost at \$3,800, the figures being based on the cost of materials in New York. Provision is made for a large living room and dining room

combined, and a roomy kitchen on the ground floor, with three bed rooms in the second story.

A school superintendent of Lake Forest, Ill., recently made a trolley journey from that town to Boston, Mass., in 78 hours, the distance being 1,512 miles. The fares totaled \$24.59.

BLESSING A MOTORBOAT IN SIAM

Native boats in Siam are nearly always blessed by a Buddhist priest before launching, and, if made of teak,



Blessing a Siamese Motorboat and Inviting the Fairy on Board

food is placed before it as an offering to the fairy that lived in the tree from which the teak wood was secured. Each teak tree in the forest is supposed to be inhabited by a fairy, so that when it is cut down and sawed into planking for boats or other purposes the fairy is rendered homeless.

The motorboat shown is a 40-ft. teak-wood craft built entirely by natives at Bangkok. On the table near its bow is a boiled boar's head. This is the offering to the fairy, who is invited to take up her home in the boat and is expected to keep it from running on snags, rocks and sandbanks.

EFFICIENT INCANDESCENT KEROSENE LAMP

A kerosene lamp with an incandescent mantle and claimed to give several times as much light as the ordinary kerosene lamp, on half the oil consumption, has recently been introduced by a Michigan firm and has

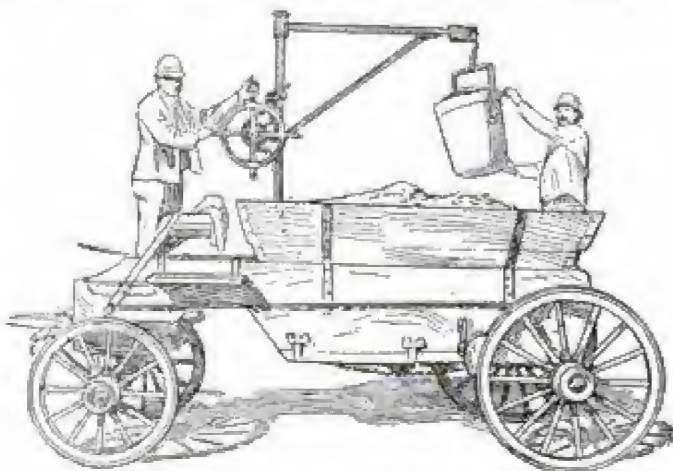
received favorable mention from an illuminating authority who reported after a two months' test that it has demonstrated its complete practicability for general use.

The lamp has a tubular wick which conducts the oil from the reservoir, but the illumination is not produced by burning the oil directly. Instead of this the oil is vaporized and mixed with air in proportions such as to produce a nonluminous, heating flame, and this is used to heat a standard, 3-in., Welsbach mantle to incandescence. The lamp emits very little heat for the amount of illumination it produces.

DIRT-EMPTYING HOIST FOR STREET-CLEANING WAGONS

The street-cleaning department of Waterbury, Conn., has equipped its wagons with a hoist for lifting the dirt cans from the street. Each street cleaner is equipped with a can and carrier, and all refuse is put into cans as soon as collected, and these are emptied into the wagons four times each day. Three double teams are constantly employed collecting the refuse.

It is said that the hoisting devices on the wagons have been found to greatly reduce the wear and tear on the cans, and also reduced the amount of time and labor required to empty



The Waterbury, Conn., Street-Cleaning Wagons are Equipped with Hoists for Lifting and Dumping the Dirt Cans

them. Larger loads can also be carried in the wagons owing to the fact that higher side and end boards can be used.



METAL WORK AND ETCHING

By JOHN D. ADAMS

Desk Sets and Blotting-Pad Corners

ONE of the most interesting tasks in connection with amateur metal work is that of making a desk set, comprising the four corners for the desk pad, a paper knife, a rocking blotter, a calendar, and such other articles as may be desired. The same general idea should, of course, characterize the designs or patterns etched on the various pieces of the set, and may often be worked out on pieces that have been purchased. For instance, a simple little oblong brass tray may be appropriately etched and when placed among the other pieces on the desk looks, for all the world, as though it had been there from the first.

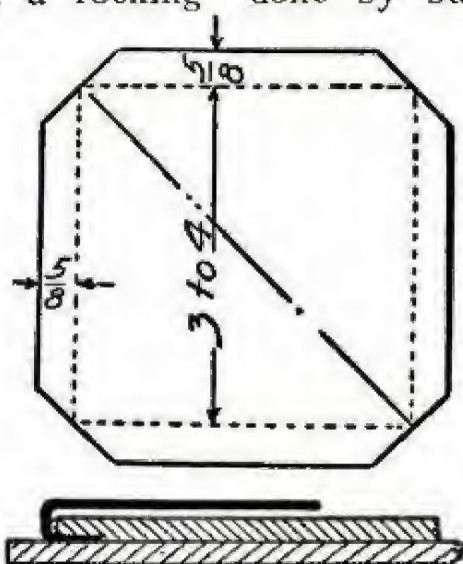
These sets may be made from either brass or copper, the latter costing about 25 per cent more than the former,

which, however, is a small consideration, as the entire cost of the required amount of either is quite small. If brass is used, the coloring may be done by butter of antimony as de-

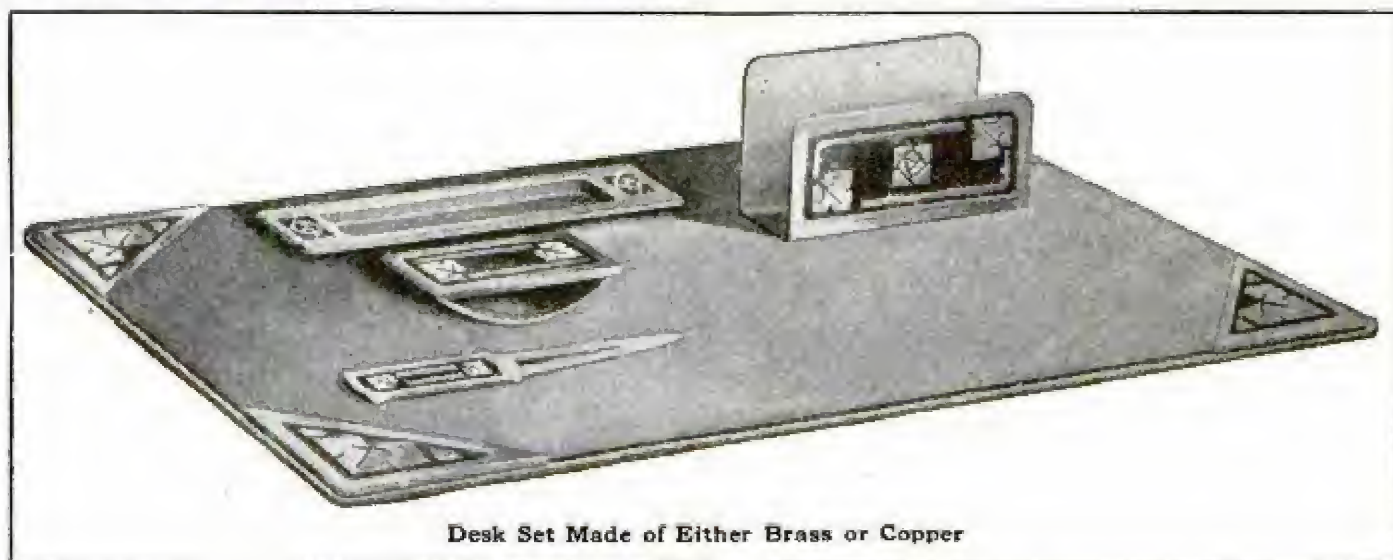
scribed in the October issue, in the case of the book end; but for copper, a solution made by dissolving about a teaspoonful of potassium sulphide in four ounces of water should be used. Polish up a scrap of the metal and then test the solution thus made before using it on something important.

The following pieces will be described in the order stated:

Corners for Blotting Pad
Paper Knives
Stationery Racks
Rocking Blotters
Calendars.



Cutting a "Pair" of Corners: Lower Drawing Showing Sectional View



Desk Set Made of Either Brass or Copper

Blotting-Pad Corners

The size of the corners for the desk pad vary from 3 to 4 in. on a side, according to the dimensions of the pad or on account of the design to be

with soap and water. The square should now be cut diagonally and the two triangles hammered perfectly flat preparatory to bending the edges.

For bending and forming sheet metal, the professional metal worker



Designs for Blotting-Pad Corners

etched on them. These can be most conveniently and economically worked up in pairs. The reason for this will be evident upon an inspection of the accompanying line drawing, which gives the size and shape of the metal necessary to make one pair. After the etching, the bending will be done along the dotted lines, and the square cut in two diagonally. Lay out the pattern to be etched full size, and after cleaning the surface to be etched with mineral wool or old emery cloth, transfer it thereto by means of the carbon transfer paper. Keep the surface free from grease. Paint out the portions that are not to be etched with the asphaltum paint, and allow it to dry over night. In passing, it may be stated that some workers prefer beeswax to the asphaltum, as it permits the etching process to proceed without any intermission for drying. This material, however, must be kept warm while being used and the painting carried on rapidly, as the wax sets almost instantly.

When the asphaltum is dry, proceed with the etching, and gauge the strength of the solution of nitric acid to such a point that only moderate bubbles will arise after five or ten minutes' immersion. Soak the piece in kerosene when sufficient depth has been etched and then remove the asphaltum with a rag, finally cleaning

has what is called a "bench plate" which is merely a socket into which may be fitted vertical irons called "stakes," these being variously shaped on their upper ends according to the duty they are to perform. In the present instance the smoothing stake, having a flat surface on top, would be selected, and, while the major portion of the triangle is firmly held down, the overhanging edge would be bent over with a mallet. An ordinary flatiron, however, answers every purpose, provided it is securely held with the face up. Where an ordinary carpenter's vise is at hand, excellent bending may be done by clamping the work between hardwood strips. If the metal is not real soft, so that it bends easily, heat it over a gas flame and then plunge into cold water. When the edges have been bent clear over, there should remain a space of about $\frac{3}{16}$ in., depending upon the thickness of the upper layer of the blotting pad.

The corners may now be thoroughly cleaned with mineral wool, or pumice and lye water, after which the coloring solution previously described should be applied. Rub up the high lights and when the desired effect has been produced, flow on a uniform coat of lacquer—and our corners are complete.

If the reader desires to make the blotting pad, also, inspect some on exhibition at the stationery store so as

to get all possible pointers. The pad, usually about 14 by 22 in., should be in two layers or sections, so that the upper one may be raised at the corners

and the bent-over edges of the metal corners inserted, after which the whole may be made secure again with glue. The sectional view clearly shows this.

MICRO-THERMOMETER DETECTS ICEBERGS

The method of taking water temperatures on transatlantic liners to guard against the approach of icebergs has been to dip water up out of the sea and take its temperature as quickly as possible. By this method continuous measurements cannot be taken, but a micro-thermometer has now been invented by a professor of McGill University, Montreal, which, with an instrument similar in action to the oscillograph attached, records the slightest changes in temperature by drawing a continuous curve.

The thermometer indicates exceedingly fine differences in temperature by means of the variations in the resistance of a coil of wire, these variations serving to indicate the changes of temperature of the medium in which the instrument is immersed. The coil consists of 250 ft. of pure-iron, silk-covered wire, wound on a copper cylinder and inclosed in a second water-tight copper cylinder.

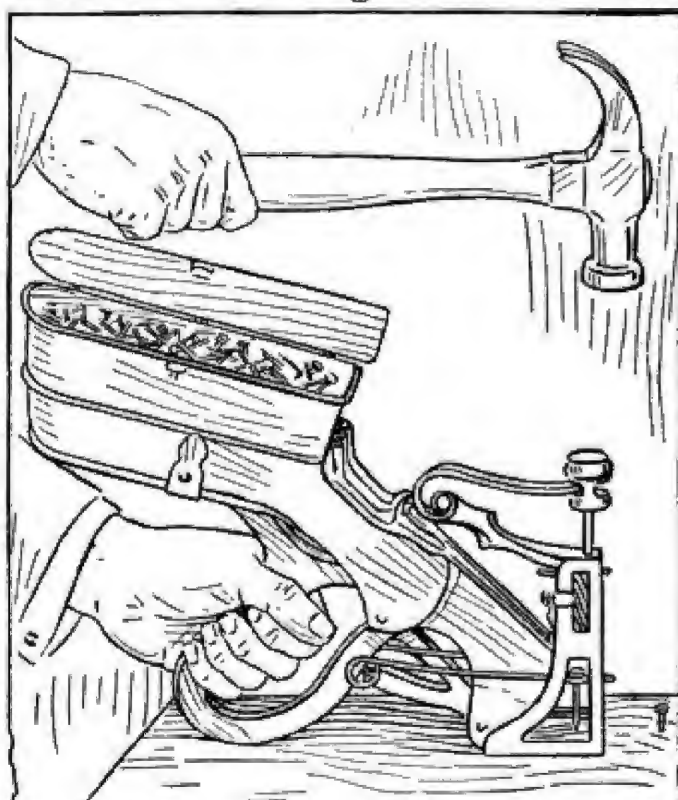
If an iceberg is large it may be detected many miles away by the coolness it causes in the water.

STEADY GROWTH OF STEEL PASSENGER COACHES

Of the 54,609 passenger coaches in service on the railroad systems of the United States at the beginning of 1911, nearly 3,000 were of all-steel construction, and 1,481 were equipped with steel underframes. Of the 2,000 passenger coaches acquired in 1909, about 24 per cent were of all-steel construction, 53 per cent of the 3,783 cars built in 1910 were all-steel, and of the 4,075 cars which will be acquired this year, 62 per cent will be all-steel.

AN IMPROVED NAILING MACHINE

This machine, which is specially designed for nailing shingles, relieves a workman from practically all trouble except that of hitting the nail on the head and of moving the machine into



The Nails are Placed in the Hopper and are Fed Automatically One at a Time under the Plunger, Ready for the Blow of the Hammer

the next position. The nails are dumped into the hopper in the bottom of which are three parallel slits. The vibration of the machine in use causes the nails to drop point downwards into the slits and hang by their heads. Thence they pass into a similar slit in the incline, and slide, still hanging by their heads, down to the catch spring. This spring holds the nail under the plunger which sets the nail in the material.

The machine can be used with the hands protected by gloves or mittens and it obviates the necessity of holding nails in the mouth, and prevents bruised fingers.

WHEAT SHEAVES AS FOOD FOR QUAIL

The game warden of the quail covers near Eastport Long Island, utilizes wheat in a unique way as a source



Unique Method of Supplying Food for Quail after Heavy Snows

of food supply for the birds during the winter months. After the first heavy snow, sheaves of wheat, one sheaf to a tree, are tied upright around the trunks, the tops bent over, and loose food strewn in all directions to attract the birds. When a new snow comes, the birds go underneath the bent-over tops and find the food, the snow never completely covering it. This has been done on a 10-in. snow, followed by a 12-in. snow, but investigation proved that there was plenty of food left, and always one side of the sheaves uncovered.

¶The Fifth International Aeronautical Congress was held at Turin, Italy, the last week of October.

SOME RECENT DYNAMITE HAPPENINGS

The unexpected sometimes happens when dynamite explodes, says Engineering and Contracting. Two recent happenings show this.

In one case a young man employed on some road-construction work in Virginia saw a pail standing by the road. Some one told him that the pail contained dynamite, so, to show that he wasn't to be bluffed that way, he kicked the pail. The dynamite exploded, and the unexpected happened, for the only injuries sustained by the young man was the loss of both shoes and the greater part of his pants.

In the other case three men, while digging a well, struck some rock which required blasting. A charge of dynamite was put in, and the fuse touched off. For some reason the charge did not explode, and after waiting some time one of the men crawled up to the well to see what was the matter. Just as he had his head well over the hole the dynamite let go, the only result being that the man lost the skin from the very tip of his nose.

Out in Iowa, there lives a man named Gotch, who, by the way, is some wrestler. One day, a couple of weeks ago, Gotch drove his car into town and there met an acquaintance, who was one of the superintendents of construction on the hydroelectric development now under way at Humboldt. The superintendent had just left the depot freight office and was carrying a package. Gotch offered to take him out to the work. The superintendent had got nicely settled in the car and Gotch was pulling the speed clutch out further and further when the latter noticed that his friend was carrying his package very tenderly and carefully. His curiosity was aroused and he inquired as to the contents, and was coolly told that it contained dynamite. Gotch nearly jumped overboard and the way he shut down on the speed was a caution.

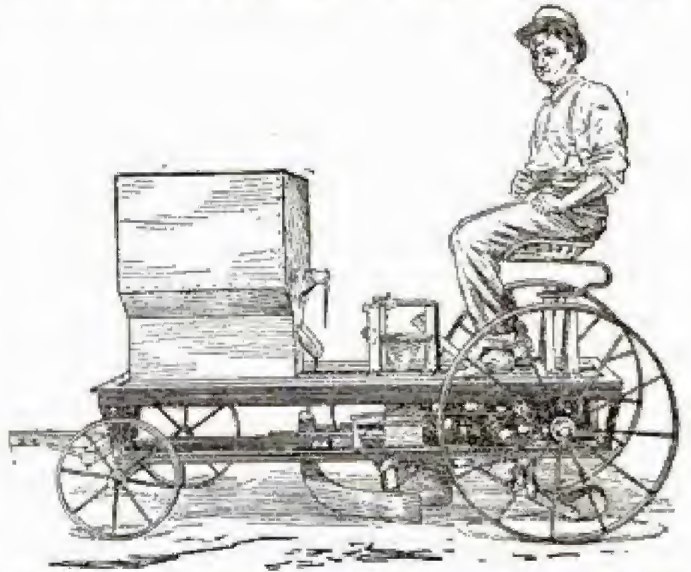
His hair didn't rise nor did he entirely stop the machine, for he was game, but the rate of motion wasn't so fast but what you could count the fence posts along the road. The manner in which Gotch searched for the soft spots in the road was surprising, while his eye vigilantly looked for rocks and bumps. To make matters even more unbearable, the superintendent sat serenely by dilating upon the terrible effect of dynamite, drawing up gruesome imaginings as to what would happen if they were so unfortunate as to drop into a rut.

When they at last arrived at the site of the dam, after what seemed the longest trip he had ever taken, and Gotch had cautiously brought the machine to a stop, his friend asked him if he had ever seen real live dynamite, and upon receiving a most emphatic "no," the genial superintendent began unwrapping his dangerous package, though Gotch protested that he had no curiosity. It was a pretty ticklish task, unwrapping dynamite, but it was finally accomplished and, behold, instead of the explosive sticks, there were a dozen harmless bolts. Before Gotch was able to extricate himself from the steering gear, the elusive superintendent was at least a block away.

AN AUTOMATIC POTATO-PLANTING MACHINE

A potato planter that cuts, plants and covers the potato, and having, it is said, a capacity of about six acres a day, is one of the newest inventions in agricultural machinery. This device, which is built mostly of steel, is automatic and positive in all its operations. The seed potatoes are held in a wooden box of about 2 bu. capacity and drop through a hopper into a spout in such a way that clogging is said to be impossible. From the spout each potato in turn is moved by a steel pick into a small hopper over the cutting knives. The pieces of the potato then drop into the planting box which

lets them fall at regular intervals behind a shoe that opens up the ground for their reception. This shoe can be

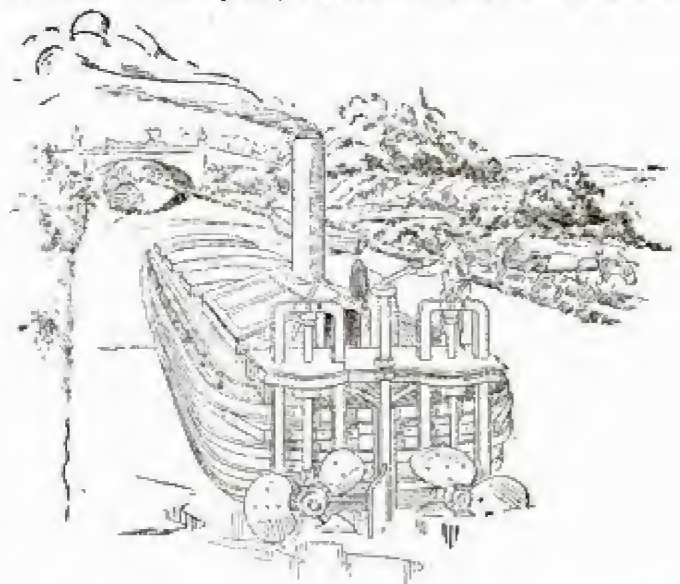


Potato-Planting Machine with Capacity for Six Acres a Day

adjusted by a hand lever to make a deep or shallow groove as required. Another attachment behind the shoe covers up the ground. All operating parts are controlled by cams, and can be thrown into or out of gear by a foot lever.

PARTLY SUBMERGED PROPELLERS

A writer in an English magazine describes a method of mounting propellers for barge propulsion in weed-filled canals which is unique. The illustration shows clearly the method of mounting, it being possible to raise or lower the propellers to suit the draft



Partly Submerged Propellers for Weed-Filled Canals

of the barge, so that they will operate only partly submerged, whether the vessel is loaded or empty. It is claimed that the partly submerged propellers drive the 80-ton barge at a good speed, and that they do not make the wash that an ordinary high-speed propeller does.

STEAM LOCOMOTIVE WITH NO FIRE OR FIREMAN

Self-propelling vehicles with compressed air contained in a suitable receiver for operating the motive mechanism have been proposed from time to time, and some of them have actually been built and operated successfully, although not on a commercial scale. But a steam locomotive using compressed steam in the same way is somewhat of a novelty. Such an engine is being exhibited at the Turin Exhibition. It has no boiler, firebox, or fireman, all of these being replaced

MEASURING THE HUMAN BODY'S SURFACE

A scientist has devised a simple and practical method of measuring accurately the surface of the human body. It consists in deducing from a number of easily taken measurements the average perimeter and the average height of the body, the surface being the product of these two quantities. This formula, which he recently announced before the French Academy of Sciences, is derived from a geometrical law, which he stated he will make known later. The method applies with equal accuracy to any size body.

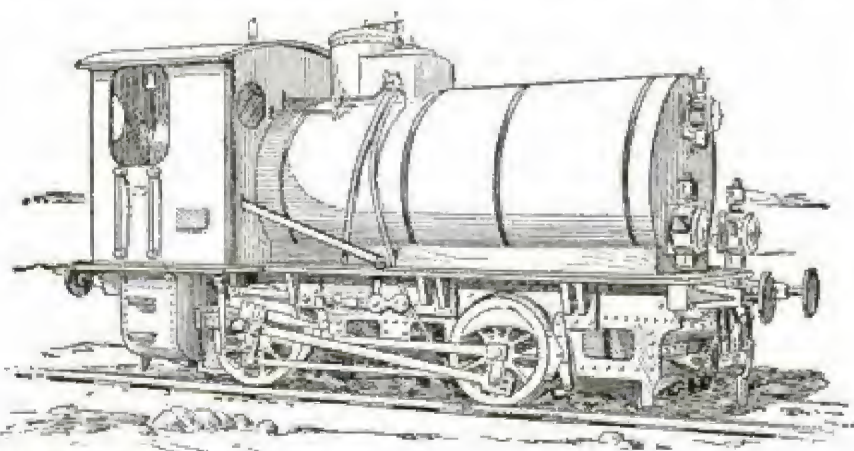
THE DESERT BREAD OF THE BEDOUNS

The black, gritty bread of the Bedouins, or nomadic tribes of Arabia, is a peculiar product of the desert. It

is made from the "samh," a small, wild plant which flourishes on the arid plateaus where no grain can be cultivated for lack of rain. The plants, which resemble lentils, are pulled by hand and beaten with sticks to remove the seed pods. The pods are then thrown into holes made in the sandy, clayey soil near the wells, covered with water, and stirred by the women,

with sticks and their bare feet, to separate the seeds from the hulls. The latter are skimmed off from the surface of the water, and the seeds are scooped up and spread out to dry. After sifting to remove as much of the grit as possible, the seeds are ground into flour in basalt handmills.

The bread is baked either on a "saj"—a convex disk of iron resting on stones and heated by a fire of manure—or in a "taboon," a dome-shaped clay oven with a pebble floor and an opening at the top, and heated by a smould-



Courtesy Illustrated London News

This Unique Engine, Which was Recently Exhibited in Europe, is Supplied with Compressed Steam before Every Run, and So Needs No Furnace or Fireman

by a large cylindrical container into which steam is forced at high pressure. This bottled-up steam enables the locomotive to go quite a distance with only the attention of an engineer.

It remains to be seen whether or not this type of engine will come into general use, but on the face of it such a scheme would appear to be better than a compressed-air device carrying its own air under pressure, as steam will hold more heat energy for a given weight or volume than any other known gas or vapor.

ering fire which is always kept burning. The bread is sometimes improved by adding to the flour a little sugar or a kind of molasses made from the seeds of the juniper tree which grows wild abundantly in the mountainous district around Petra.

PENNY-IN-THE-SLOT TRAIN SPEEDOMETERS

Several of the observation cars of the limited trains of a railway system



in England have been equipped with penny - in-the-slot speedometers to afford inquisitive passengers an opportunity to ascertain the speed the train is making.

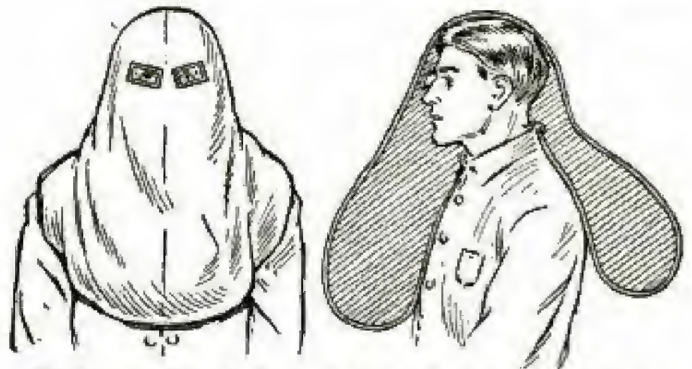
The working parts of the mechanism comprise a slotted box with its dial and a push button, a flexible shaft and a

metallic wire connecting it with a small pulley inclosed in a box under the floor of the car, and another pulley on the axle of the truck, the two pulleys being connected by a belt transmission. The dropping of the coin in the box releases the button which, when pushed, sets the mechanism in operation. As soon as the button is released, a clutch is disengaged and the hand returns to the zero point.

That the ancients did not exclusively use mirrors of polished metal as generally believed has been recently proved by the finding of a number of small glass mirrors in a graveyard at Lai-bach, Austria. They are said to date from the second or third century.

FIREMAN'S HOOD FOR USE WITH HELMET

A fireman's hood, designed for emergency use in connection with the ordinary fireman's helmet, is here



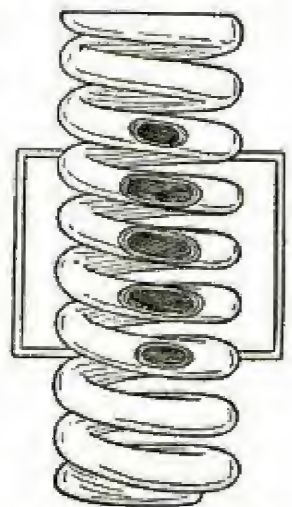
Waterproof and Fireproof Air Hood for Firemen

shown. It is made of a waterproof and fireproof material, and is so constructed that it can be inflated with air by being swung from side to side as a grocer swings a paper bag. It is then placed over the wearer's head and tightened to a snug fit around his neck. When not in use, it folds up small enough to be carried in a fireman's blouse or coat pocket. It is said that the air so provided can be used about 10 or 15 minutes.

HOLLOW STEEL SPRINGS

Although the use of steel tubing in construction work is most generally confined to the parts of which a high degree of rigidity and strength is required, a French engineer has recently proved that such tubing serves equally well for springs.

The tests were made at the Paris Arts - and - Crafts Conservatory on a spring having a wall of 0.04 in. Under a load of 660 lb., it stretched 2.8 in., and, when the weight was removed, returned to within 0.04 in. of its original length. A solid spring of the same outside dimension



stretched only 1.2 in. under the same load, and under a load which stretched it 2.6 in. underwent a permanent deformation of $\frac{1}{4}$ in. According to this

test the tubular spring is much more elastic than the solid spring, stretches more, and returns more closely to its original length.

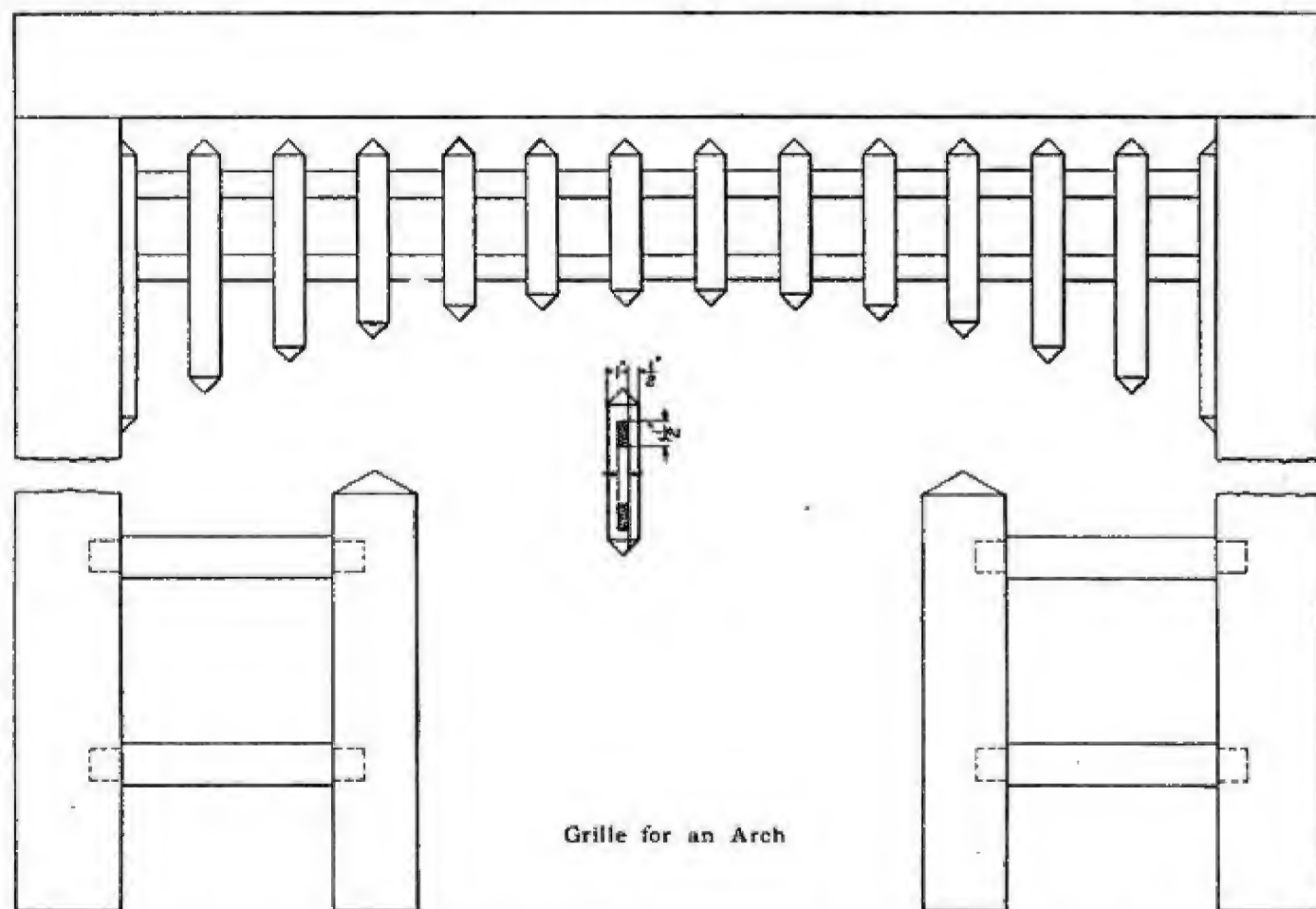
A MISSION GRILLE WITH PEDESTALS TO MATCH

The accompanying sketch shows something unique in a grille that adds to the appearance of a home furnished in mission style. When it is stained and finished to match the furniture, it gives a consummate tone that would be difficult to obtain by any other means.

To get the best results it should be made to blend with the furniture and the arch in which it is to fit, in both

the bars is shown in the detailed sketch. The two end bars should be made of solid pieces, $\frac{3}{4}$ by $1\frac{1}{2}$ in., with two rectangular slots mortised in each to receive the supports. The supports should be just the right length to go in the arch. To erect, slip the end bars on the supports, hold the grille in place and fasten the bars to the sides of the arch with screws.

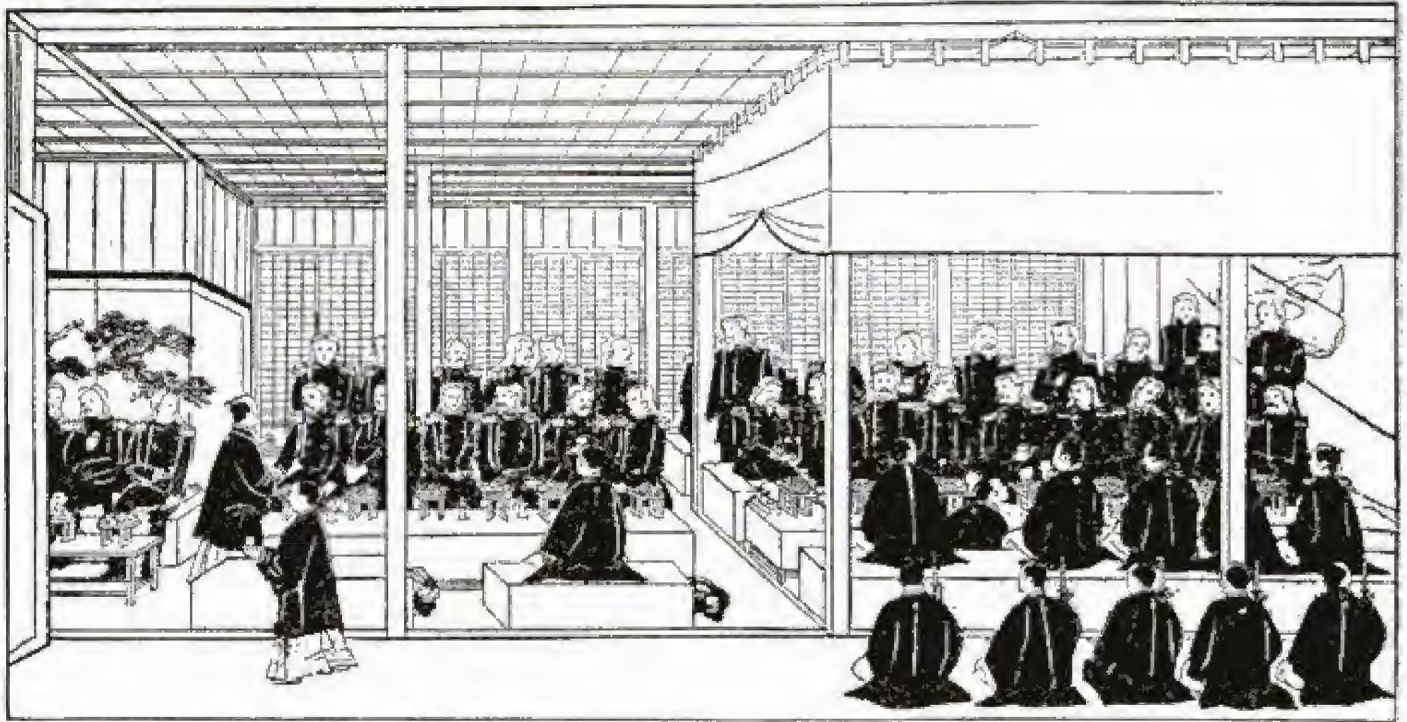
The size of the pedestals and the



weight and style. This will depend very much upon one's preference, and for this reason full dimensions are not given. No difficulty will be experienced, however, by anyone handy with tools, in making it.

The material should be quarter-sawed oak, which can be secured planed and sanded at the mill. For the grille, order 1 by $1\frac{1}{2}$ -in. and $\frac{1}{2}$ by $1\frac{1}{2}$ -in. stock. The method of making

connecting pieces will depend upon the size of the arch. These connecting pieces should be well mortised into the post, and if you own your own home and intend the pedestals to become a fixture, they should also be mortised into the sides of the arch. If not, they may be fastened to the arch with blind screws. The amount of material required will, of course, depend upon the size of the arch.



BEGINNING OF THE FRIENDSHIP BETWEEN THE UNITED STATES AND JAPAN

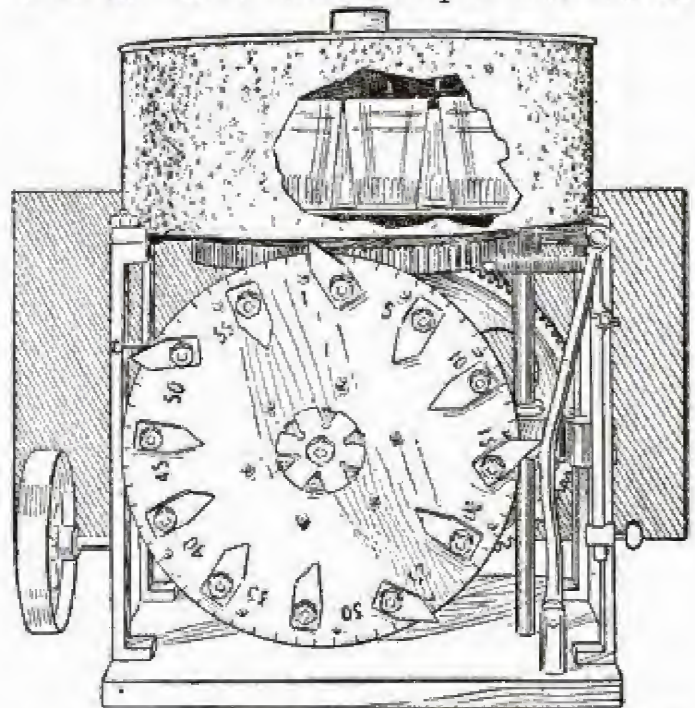
A Japanese Drawing of the Banquet Tendered Commodore Perry and His Officers by the Shogunate on the Occasion of Perry's Visit to Japan Forty Years Ago

AUTOMATIC FLOUR-SAMPLING MACHINE

An automatic flour-sampling machine, designed for flour mills, by means of which the head miller is automatically provided with a sample of the flour every hour, or as often as desired, has been placed on the market by a New York milling concern. The machine is particularly valuable for night runs, as the head miller can set it when he leaves in the evening and in the morning have samples of the flour made every hour throughout the night, enabling him to check up and compare it with the day run.

The machine weighs only 100 lb., is 24 in. in height and 20 in. wide. It is operated by clockwork, has a dial equipped with 12 dogs representing 12 discharges, and 14 sample glasses are provided in its top. The machine is usually set as close as possible to the discharge spout, in which is placed a 4-in. valve. This valve is opened at the desired time through the operation of one of the dogs on the dial, and allows two or three ounces of flour to pass through the spout into the sample

glass. The clockwork spaces the sample glasses so that each stops directly under the spout to receive the sample, and the time each sample was taken

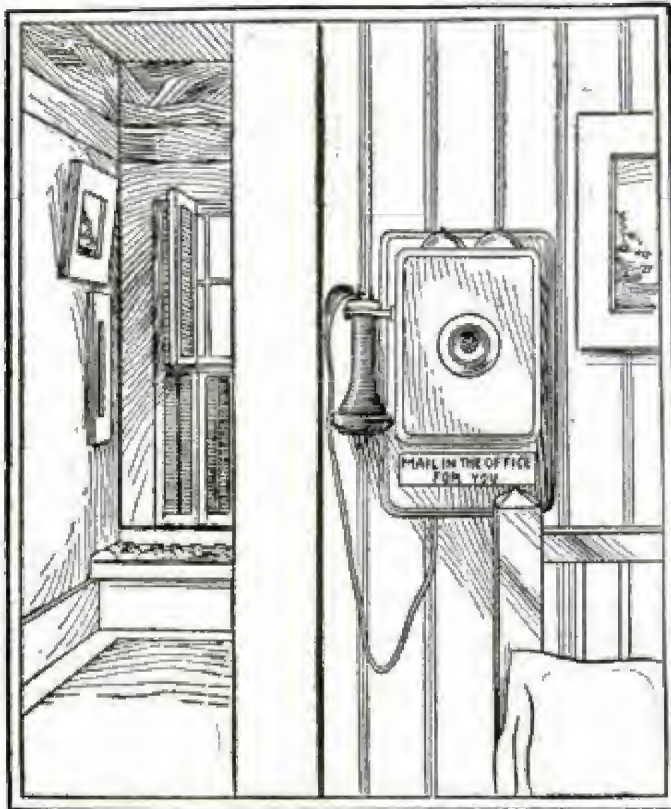


An Automatic Flour-Sampling Machine Which Gives the Head Miller a Sample of the Flour Milled during Each Hour of the Night

is automatically recorded. The whole is entirely automatic, requires very little power, and needs no attention beyond setting at night and examining the results in the morning.

ELECTRIC SIGN ANNOUNCES ARRIVAL OF MAIL

The rooms of several hotels in this country are now equipped with electric signs announcing the arrival of



Electric Annunciator on Hotel Telephone Announces Arrival of Mail

mail the moment it is placed in the boxes. Under the telephone in each room is a glass-fronted box containing an electric light. Painted on the inside of the glass, and only visible when the electric light is turned on, is the announcement "mail in the office for you." Each box or compartment in the mail-distributing rack has a little shutter, which is pushed back when the letter or paper is thrust in, thus closing the circuit leading to the lamp in the room the box represents.

WORK OF FILING AS VIEWED PHYSIOLOGICALLY

The action and value of the muscles brought into play by a mechanic while at work filing, and the action of the file on the material being worked, would not seem to be of sufficient interest for scientific study. Yet a French scientist, M. Imbert, known for his studies of the work of skilled mechanics from

a physiological point of view, has found it so, and recently announced the result of his investigation before the French Academy of Science.

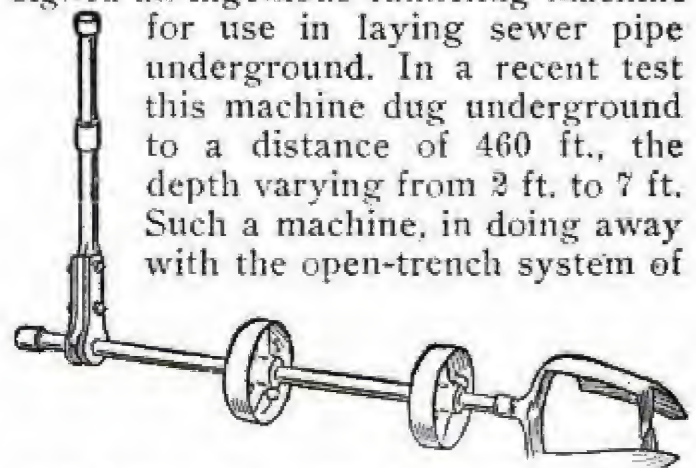
By means of special apparatus he has recorded the movements of the file, the oscillation of the upper part of the mechanic's body during work, the horizontal and vertical components of the force applied by the right hand and by the left hand, and the time of stroke.

Comparisons of his data bring forth the fact that, as might be expected, the various lines that record the motions of skilled mechanics varied but little, presenting the same characteristics, which might be said conclusively to indicate professional skill. With the work of apprentices, however, the lines traced varied widely and at different phases of the work.

It would seem, therefore, that the method of investigation adopted by the French scientist would afford means not only for determining whether or not an applicant is a skilled filer, but also for finding out in what particular part of the work an apprentice is deficient. Furthermore, deviations from the normal tracings of a workman considered skilled were found to be caused by atrophy of the shoulder muscles, so that even in this direction the method might be of some value.

PIPE-LINE TUNNELING MACHINE

A Texas plumbing concern has designed an ingenious tunneling machine for use in laying sewer pipe underground. In a recent test this machine dug underground to a distance of 460 ft., the depth varying from 2 ft. to 7 ft. Such a machine, in doing away with the open-trench system of



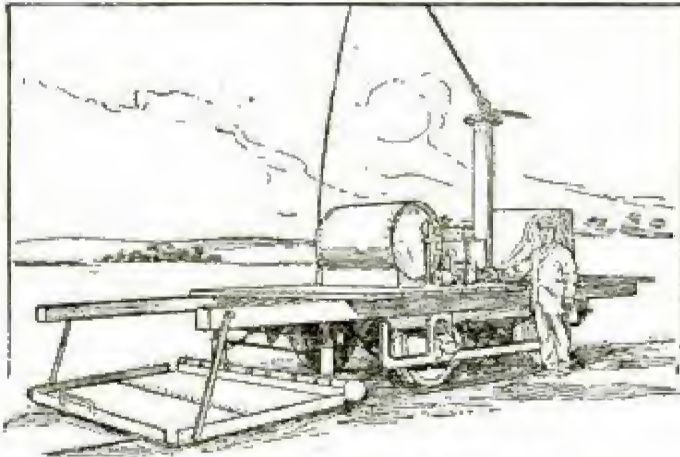
This Machine Digs Tunnel for Laying Sewer Pipe

laying sewer pipe, eliminates the necessity of tearing up a lawn when piping has to be laid.

NEW WEED BURNER FOR RAILROAD TRACKS

Weed-burning devices for clearing railroad tracks and embankments from vegetation have been in use for many years, but this weed burner embodies new features that make it worthy of mention.

A 5-gal. crude-oil container is mounted with a compressed-air equipment of 50 cu. ft. capacity on an old single truck, and trailing behind the latter is an apron from under which the flame shoots out and scorches the



Weed Burner for Electric Railroad Tracks

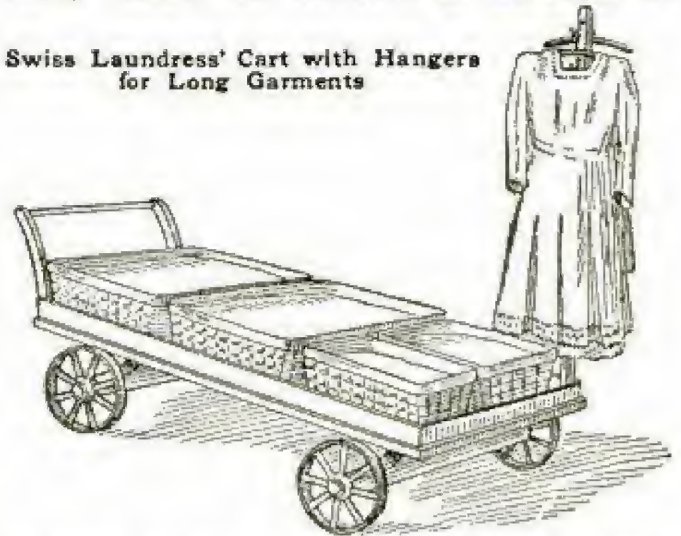
weeds, which die in about 24 hours under sunny conditions of weather. The dead weeds are later removed and burned. A water tank is carried to enable the operators to extinguish possible fires in old dry ties. Good, sound ties will not catch fire readily. The weed burner, with a crew of two or three men, can cover two miles an hour on the level with ease. It is being used with success on an electric railroad in Ohio.

SWISS DELIVER LAUNDRY WITHOUT FOLDING

In Switzerland much of the laundry work is done by laundresses in their homes. The method of delivering the clean clothing is one of the curious sights that attract the American tour-

ist in the Swiss cities. This is accomplished by means of a four-wheeled cart, built to receive a number of

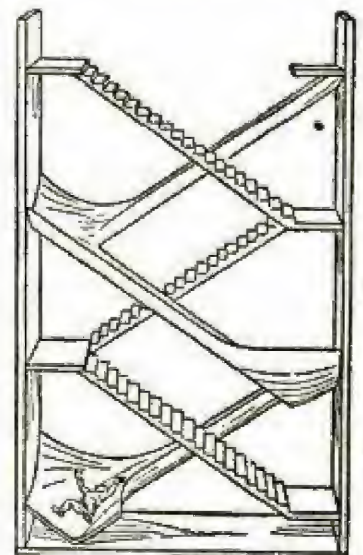
Swiss Laundress' Cart with Hangers for Long Garments



square baskets of various sizes. The unique feature of the cart, however, is a post that is erected in one corner, from a hook at the top of which are suspended the long dresses and other garments that would be spoiled by folding. The garments are hung on coat hangers of the familiar type. No covering is placed over them and they are at the mercy of whatever germs and dust happen to be filling the air at the time the cart is trundled through the streets.

COMBINED SLIDE AND STAIR FIRE ESCAPE

A new type of slide fire escape, which can be combined with a stair fire escape in the same shaft or allotted space, has been designed by an inventor of Montreal, Canada. The general arrangement of the slide is the same as that of an ordinary stair escape, with a landing at either end. The slide runs straight from one side of the tower or

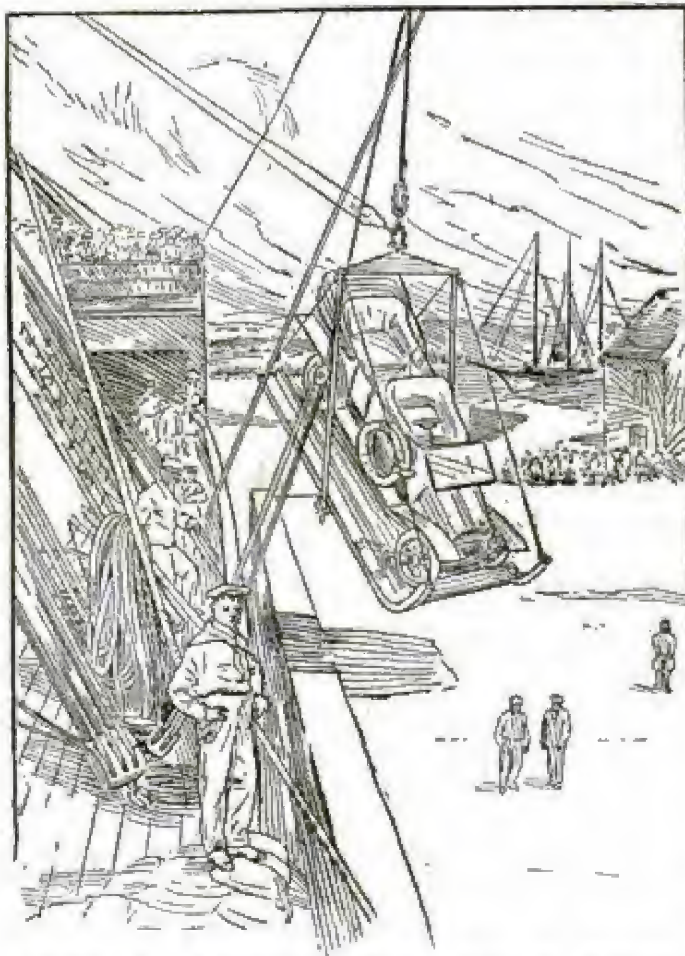


shaft to the other, then turns by means of a banked-up curve and drops to another level in the opposite direction.

The features claimed for this arrangement are, that persons using the escape can be admitted at every floor, that the banked turns correct the pace of the sliding persons in such manner that they are sliding no faster on the last lap than on the first, and that a choice is had of either the slide or the stair escape as a means of reaching the ground.

LIFTING AUTOMOBILES ABOARD SHIP

Automobiles being transported across the Atlantic from New York to Europe are usually completely boxed



Loading an Automobile Aboard Ship at Bremen, Germany

for shipment, but in the shorter journeys, as, for instance, the trip from Bremen, Germany, to Southampton, Eng., they are shipped bare. This necessitates some kind of special gear for loading them aboard ship and for un-

loading, and one of the steamship companies has adopted the type shown in the illustration.

MINT PREVENTS MALARIAL FEVERS

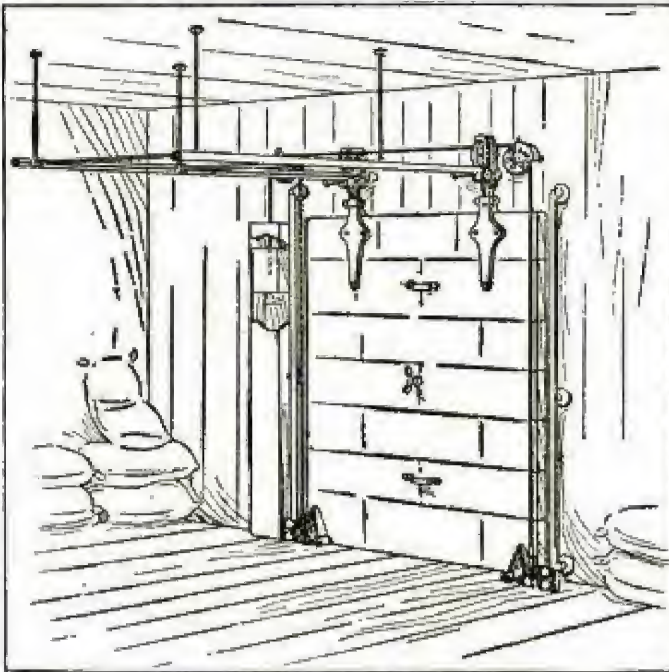
It has been claimed, although verification has hitherto been lacking, that the basil, a tropical plant related to the mint family, which emits a pungent odor, effectively keeps mosquitoes and other disease-carrying insects at a distance.

Recently, however, Captain Larrymore, a British army officer stationed in western Africa, has proved conclusively the beneficent effect of this plant. He has been able to completely immunize his camp from malarial fevers by growing rows of the basil around it. And he found, furthermore, that one or two basils placed in pots in a room suffice to drive away the flies that propagate the deadly sleeping sickness.

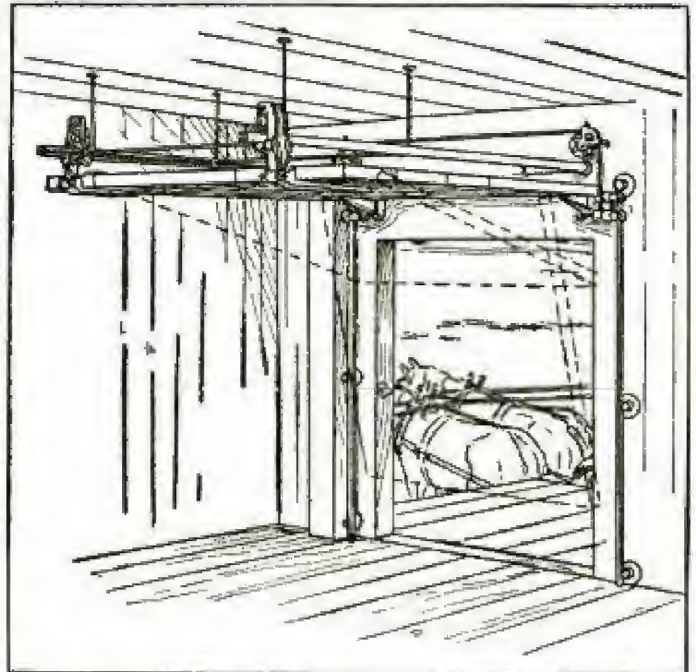
A HORIZONTAL TROLLEY DOOR

In order to provide warehouse doors in places where the headroom is not sufficient to permit of the use of vertical doors and where obstructions at the side of the door opening prohibit the installation of sliding doors, the ingenious construction shown in the accompanying illustrations has been adopted. The door is hung by means of hinged attachments from two trolleys which slide on horizontal runways perpendicular to the wall. At its two bottom corners it is connected by cables, running over suitably placed pulleys, to the counterbalancing weight in the pocket to one side. The door, when opened, slides outward on the horizontal runways and at the same time it is lifted upward by its bottom corners, a combined movement which is exactly the same as that of the slider on the cross-arm variety of ellipsograph.

The construction illustrated here-



Warehouse Door for Use in Places having Side Obstructions and Limited Headroom



The Door Opened. Intermediate Positions of Door are Shown by Dotted Lines

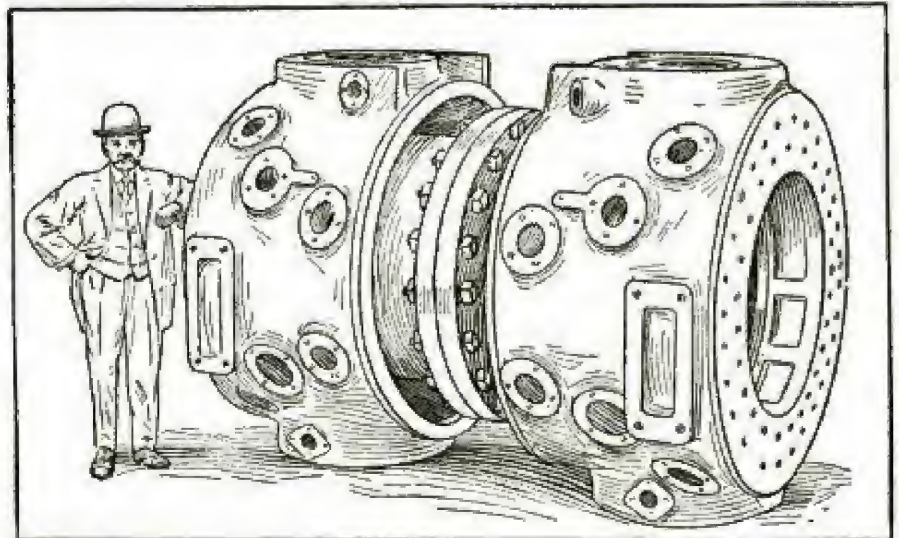
with is intended for doorways not exceeding 8 ft. wide. For wider openings, three or more horizontal hangers

are recommended. An automatic fusible-link device is also provided for tin-clad fire doors.

OLD SHOES IN NEW ROAD CONSTRUCTION

Old shoes and other leather waste is now being acclaimed a fine material for road construction. Old leather of all kinds and conditions, including old shoes, leather-factory waste, etc., is torn to pieces by mechanical means and treated with asphalt and tar. A road made of such material recently is claimed to have been found eminently satisfactory. It is almost dustless, very elastic and silent, and neither horse traffic nor the heaviest motor cars have shown any deteriorating effect upon it.

an important stage in the development of the large gas engine. Without going into technical details it may be said that this engine will comprise the very latest refinements in gas-engine practice and it is confidently asserted that in reliability and economy of



Cylinder of 1,350-Brake-Horsepower Gas Engine for Continuous Day-and-Night Service

A GAS ENGINE OF 1,350 BRAKE HORSEPOWER

The 1,350-brake-horsepower gas engine being built by a British firm for continuous operation of the electric-light plant of a chemical works marks

operation it will rival the best steam engines of similar power.

Special methods have been adopted in the building up of the cylinders to eliminate any stresses set up in the metal either in the casting or owing to temperature changes in operation.

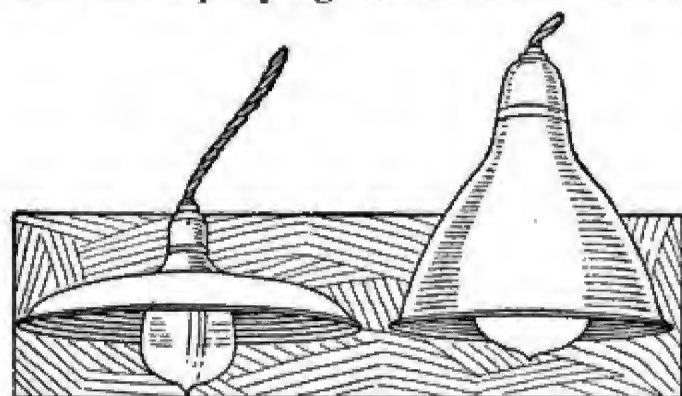
Any tendency to cross bending is avoided by connecting the cylinders and frames by bored and turned joints to secure perfect alinement.

The engine is of the horizontal, double-acting type, with tandem cylin-

ders, and operates on the four-cycle principle. It weighs about 180 tons, and the flywheel about 56 tons. The two cylinders have a diameter of 37.4 in., the stroke being 43.3 in. The speed is 105 revolutions per minute.

COMBINATION ELECTRIC-LAMP FIXTURE

Two shapes of an ingenious combination electric-lamp fixture, designed for offices and factories, are shown in the accompanying illustration. Each



A Bowl Shape in the Combination Type of Fixture

The Dome-Shaped Combination Electric Lamp Fixture

is a combination socket, shade-holder, insulating joint and reflector, and, being all in one unit, eliminates the several separate parts required in building up a successful lighting unit.

MUSIC BOX THAT OPERATES ITS OWN ECHO

A giant music box with an echo is the newest device on the market for the automatic production of musical selections. This machine is a large orchestral instrument that reproduces the notes of 45 instruments. It is operated by electricity and the selections it is to play are on perforated paper rolls, in much the same manner as the player pianos. The mechanism for producing the "echo" is in another case or box and may be placed any distance from the instrument in which the original perforated roll is inserted. Connection between the two is by electric current. The "echo" is not provided

with apparatus for the reproduction of all of the instruments found in the original, the idea being to make the second tones softer, for which purpose only reed instruments are used. The instrument to produce the original composition is started by means of an electric switch. After the first musical phrase or movement has been played, the machinery stops and the "echo" instrument is automatically put in operation. The "echo" differs from a real echo in that it frequently plays the selection with variations. When the phrase is finished, the original instrument takes up the burden of the song again and plays another section, which is in turn repeated by the "echo." This system is continued until the selection is finished. When the music is completed the mechanism rewinds the perforated roll and it is in position to play again. Aside from the fact that the device includes two complete music-producing machines, a new feature is the perforated roll with a number of selections. Some of the rolls have as many as six selections on them and any one of these can be played without reference to the others by the simple operation of the indicating mechanism, which is placed beside the switch that starts the "orchestra."

¶ Pearls are produced by cocoanuts in the Malay peninsula, according to Consul-general DuBois. The pearls are pure white, bring high prices and are supposed by the natives to possess some kind of charm.

¶ Four hundred million envelopes will be required by the government during the next four years to carry on its correspondence.

LOAF OF BREAD TWELVE FEET LONG

The North Dakota Shriners attending the convention recently held in Rochester, N. Y., carried along with them a loaf of bread 12 ft. long, 2 ft. wide, and weighing 250 lb., as the product of a great wheat-growing state.

The giant loaf of bread was made at the North Dakota Agricultural College, under the supervision of Professor Arnold. The dough was made by the bakers of the experiment station from the finest hard-wheat flour the state could produce, and the loaf was baked in a pan 12 ft. long by 2 ft. wide. It rose in the baking pan to a height of 10 in. The bakers who made the loaf calculated that it would make 12,500

good-sized sandwiches, and that, if it could be kept fresh, it would keep a man and his wife in bread for a year.



A 12-Ft. Loaf of Bread from Which 12,500 Sandwiches Could Have Been Made

After its appearance in the Shriners' procession the mammoth loaf was given to swell the supplies of an industrial school.

TESTING AUTO ENGINES IN REFRIGERATOR



The Dynamometer and the Outside of the Automobile Cold-Storage Room



Interior of the Automobile Refrigerator Where a Zero Temperature Can be Obtained

A refrigerator chamber in which to test automobile engines in an attempt to duplicate conditions under which motors would have to run in severe winter weather has been established in the factory of an Indianapolis carburetor manufacturer. This chamber is part of an extensive laboratory

which contains many appliances to test automobile motors and their various parts. There are, among other things, scales for weighing the fuel; a pyrometer to measure the temperature of the exhaust, a meter to show the amount of air taken into the carburetor, and dynamometers to test the ca-

capacity of the motors under varying conditions.

Any temperature from ordinary cool air to zero can be obtained in the testing room.

HORSE-RACING SLEIGH

Horse racing on the ice is one of the many winter sports in Norway. The sleighs used are very light, and



Ice Horse-Racing in Norway

carry a seat similar to those on racing sulkies in this country. The horses are especially shod for racing on ice and make considerably better time than on circular race tracks.

ASTRONOMICAL CLOCK 520 YEARS OLD

In Exeter Cathedral, England, is a curious astronomical clock which dates from about 1390, some of the parts, indeed, being even older than that. Parts of the works are considered by authorities to be portions of the clock referred to in the patent rolls of Edward II, who was England's king from 1307 to 1327, which would make it the earliest astronomical timepiece in England.

In the center of the dial is a globe representing the earth, around which the sun, represented by a fleur-de-lis, is made to revolve. On the outer edge of the dial is a circle subdivided into 24 divisions, from which the hours of the day may be read. Inside this is another circle divided into 30 divisions, which show the moon's age in days.

ⒸSolidified oil is being used as a lubricant on a large number of the cars of a Cleveland, Ohio, railway company. The lubricant is made by mixing long-strand wool waste with a solidified oil claimed to be free from acid or other chemicals.

GERMAN BOYS AND GIRLS IN MILITARY DRILL

The popularity of the Boy Scouts organization in the United States and England has called attention to the existence on the island of Borkum, a possession of Germany in the North Sea, of what is known as the Black-White-and-Green Regiment of boys and girls, and young men and women. Borkum is a famous seaside resort for wealthy German families. In 1898 the children on the island for the summer organized a military company. From time to time since then other companies have been formed until now a complete regimental organization is maintained with a colonel, lieutenant colonel, majors and captains in equal number to the regiments in the German army.

There is a complete set of by-laws and regulations for the government of the members, and the work of supervising the organization is in the hands of a committee or advisory board of adults. There are companies of boys and girls and exercises are held every day during the summer, except Sunday. Each of the companies has a headquarters, and a monthly newspaper is published by the regiment which becomes a weekly during the month of July. Branches of the organization exist in all large cities of Germany contributing to the summer population of Borkum, and in this way the interest in the regiment is maintained the year round.



Girls' Company at Borkum Drilling on the Beach



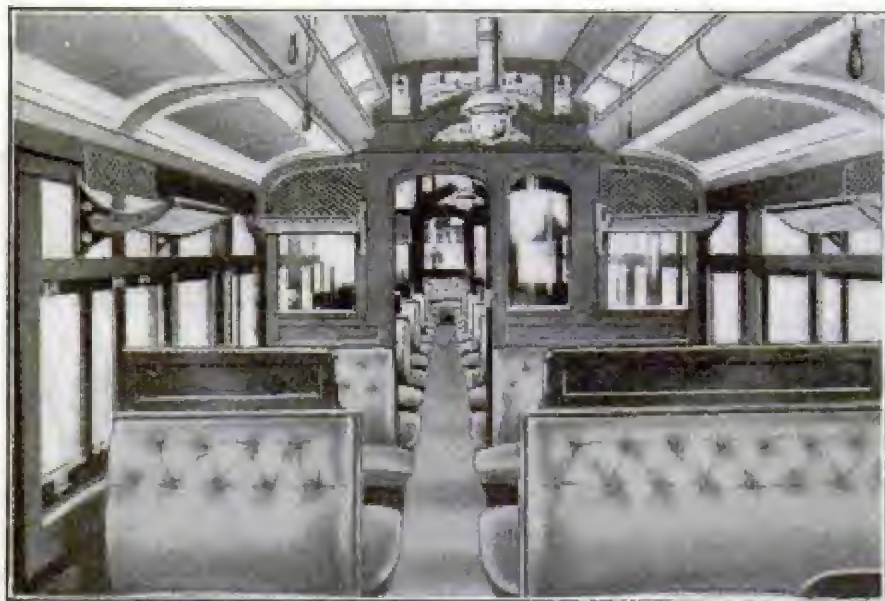
German Girls' Military Company at Borkum



Exercises of a Company of the German Children's Regiment

AUSTRALIAN RAILROAD HAS SUBURBAN CARS

The Victorian Railways Commissioners have adopted a special type of



New Type of Car Adopted by Railroads in Victoria, Australia, for Suburban Traffic

suburban coach for use on the railroads in Victoria, Australia. According to the "Scientific Australian," the passengers standing on station platforms are no longer at the mercy of flying doors, there are no longer crowded compartments at one end of the coach and half occupied ones at the other, and the seating accommodation has been greatly improved.

ARC LIGHT USED TO TRACE ECHOES

An arc light was most ingeniously used to trace the source of the echoes which have proved so troublesome in the auditorium of the University of Illinois. This auditorium is shaped nearly like a hemisphere, with several large arches breaking the regularity of the surface.

Because of the lack of definite information about echoes, several methods were tried in the past two years to trace the path of the sounds, and of these the only satisfactory method involved the use of an alternating-current arc light at the focus of a parabolic reflector. In addition to the light, the arc gave two sets of sounds, one being

a hum due to the alternations of the current, and the other a successive "spitting" of the arc. This latter sound was of short wave-length and therefore experienced little diffraction. The bun-

dle of light rays also included a bundle of sound waves, the sources of both being at the same place and subject to the same law of deflection. The paths of the sound rays were therefore easily found, the observer being able to see where they were struck by noting the position of the spot of light. To trace successive reflections, small mirrors were fastened to the walls and the path of the reflected light was thus easily fol-

lowed. The result was a complete diagnosis of the acoustic troubles of the auditorium, and methods of cure can now be applied intelligently.

WIRELESS GOVERNMENT MONOPOLY IN FRANCE

Wireless telegraphy is a government monopoly in France and no private individual, according to Cosmos, a French scientific publication, may possess either a sending or receiving station. Consequently, the time signals sent out twice every 24 hours from the wireless station in the Eiffel tower, although free to anyone having a receiving apparatus and living outside the boundaries of France, are not available for private individuals in France. Thus the Frenchman pays for the service and his neighbor within a radius of about 1,200 miles reaps the benefit.

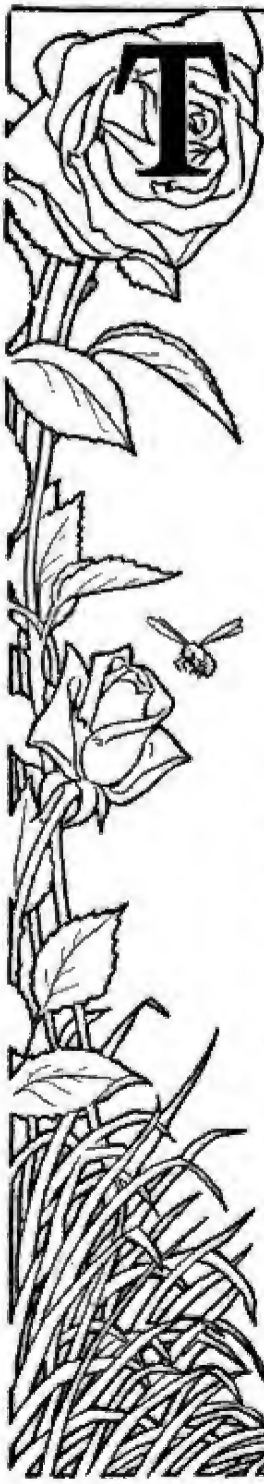
⌘The new navy collier "Jupiter," building at the Mare Island navy yard, California, will be equipped for electric propulsion. The equipment is experimental. The electric company making the installation assumes all responsibility.

The Kingdom of Dust

By J. Gordon Ogden, Ph. D.

THIS is the ninth of a series of articles by Dr. Ogden, who is professor of physics at the Fifth Avenue High School, Pittsburg, Pa. In every home, in every office, in every shop or factory, the fight against Dust is never-ending. Dr. Ogden illuminates this subject in a manner which brings a realization of its infinite importance.


IX—Perfumes and Odors in the Dust



THROUGHOUT the vast and mighty realms of the Kingdom of Dust, there are no subjects so welcome to mankind as those whose province it is to excite the sense of smell. They come to us in the sweet fragrance of the pine forest, the soft zephyrs that are wafted to us from heaps of new-mown hay, the delightful scents of garden and meadow, and the invigorating breezes of ocean shore and mountain side. Likewise, from other sources, come other scents and odors, not quite so agreeable or pleasant, and with which we could very well dispense.

The senses are the highways by means of which there is a connection between the things that constitute the outer world, and the inner consciousness that we call Self. Could we not see, hear, smell, taste, or touch, we would be lower in rank than an oyster, as even an oyster has most of these senses. Of all the senses, the sense of smell is probably the oldest, next to the sense of touch, of which, as Democritus pointed out long ago, all the senses are modifications. We find it widely distributed throughout the animal kingdom from the jellyfish up to man, and located in wonderfully diverse forms, such as hairs, antennæ, delicate tubes, cones, knobs, and membranes.

Like all the other senses, its keenness and delicacy depend upon how much it is used. A vulture, for example, has five times the smelling power of a turkey, simply from the fact that the vulture would starve if it could not detect the odor of its food miles away, while a turkey does not depend upon its olfactory powers for a livelihood. Swine have





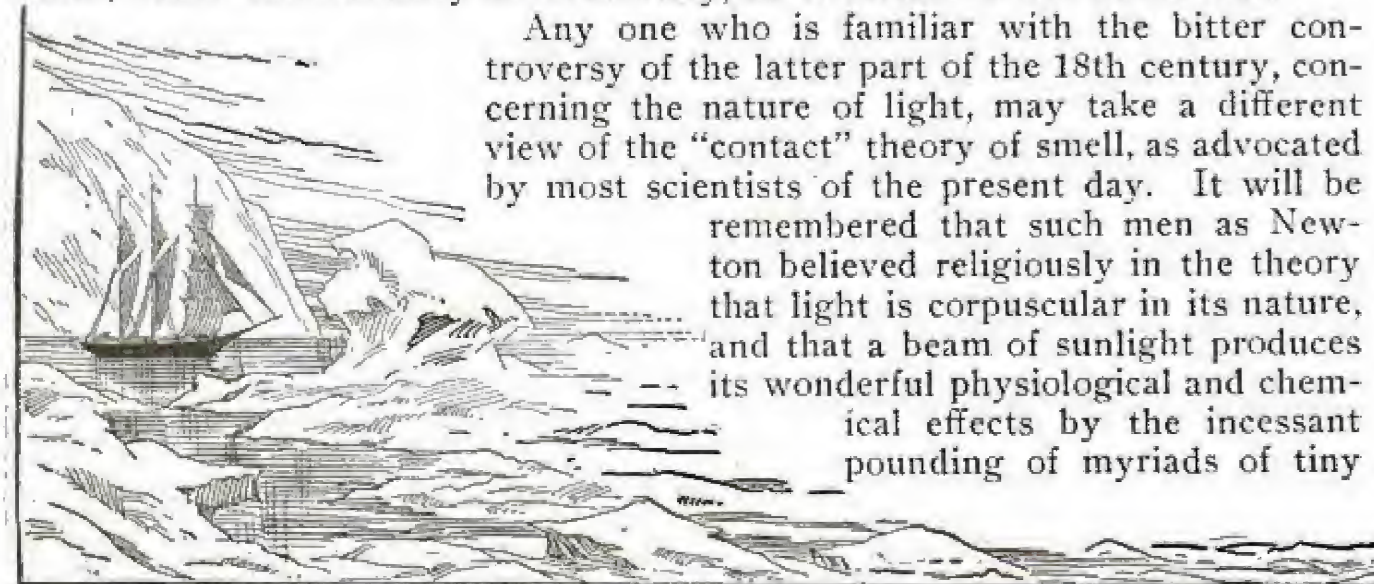
Possibly the Bertillon System will be Discarded for One Based on Smells

exceedingly well developed and complicated smelling apparatus. Flesh-eating animals, as a rule, have more highly organized olfactory organs than those that subsist upon plants. An elephant has small and contracted nasal parts, but it makes up for this, in a degree at least, in having the longest nose in the world, the nerves extending to the nostrils at the very tip of the proboscis or trunk. Curiously enough, it is quite probable that the sense of smell is entirely lacking in the largest animals that live, or ever did live—the whales. Only the whale-bone whale has olfactory organs. The smelling apparatus of a bear is exceedingly complicated. The portion of its skull given over to that function, and known as the turbinated bones, are so folded and divided that they look like a section of a honeycomb. No wonder the polar bear has been known to scent a ship at the distance of seven miles.

The effect of certain smells, such as catnip and valerian upon cats, is well known, producing a condition that is practically intoxication.

Although the senses have been carefully studied by the scientists of every age and of every clime, we know less of the older senses than we do of those that give us sight and hearing. We know something about the mechanism by means of which we become conscious of odors, but we do not as yet thoroughly understand how this mechanism works, or is incited to activity. It is generally admitted that smell is the result of the direct contact of material particles with the ends of delicate nerves that communicate with the olfactory bulb—a nerve center situated at the back portion of the upper nose—and transmitted thence to the base of the brain. These material particles may be in the form of a gas or vapor, as gases and vapors are, after all, only matter that is extremely divided, undoubted subjects of the Kingdom of Dust. It is supposed that these particles move about on the damp surface of the olfactory membrane, in very much the same manner as small particles of camphor move to and fro on the surface of water, and that they cause, either mechanically or chemically, an irritation of the nerve ends.

Any one who is familiar with the bitter controversy of the latter part of the 18th century, concerning the nature of light, may take a different view of the "contact" theory of smell, as advocated by most scientists of the present day. It will be remembered that such men as Newton believed religiously in the theory that light is corpuscular in its nature, and that a beam of sunlight produces its wonderful physiological and chemical effects by the incessant pounding of myriads of tiny



The Polar Bear has been Known to Scent

little particles of matter known as corpuscles. Thomas Young, an English physician and scientist, was a bitter opponent of the "corpuscular" theory of light, and on November 21, 1801, delivered a lecture before the Royal Society, in which he demonstrated the truth of the theory of Hooke and Huygens, that light is solely a form of wave motion. Since that time scientists have commonly adopted the undulatory or wave theory of light. Possibly the same revolution of ideas may occur concerning the nature and transference of odors. There are many facts that point that way. Ramsay, the celebrated English chemist, is a believer in the "wave" theory of smell, and declares that "the sense of smell is excited by vibrations of a lower period than those which give rise to the sense of light or heat." He also states that a substance to have an odor must be at least 15 times heavier than hydrogen gas, and that as a rule all substances having a low molecular weight have either no smell at all or else produce an effect by irritation of the delicate membranes. He further states that as the specific gravities of gases rise, their smell is increased, especially in the carbon compounds. Acids, likewise, gain in odor, as the densities of their gases increase.

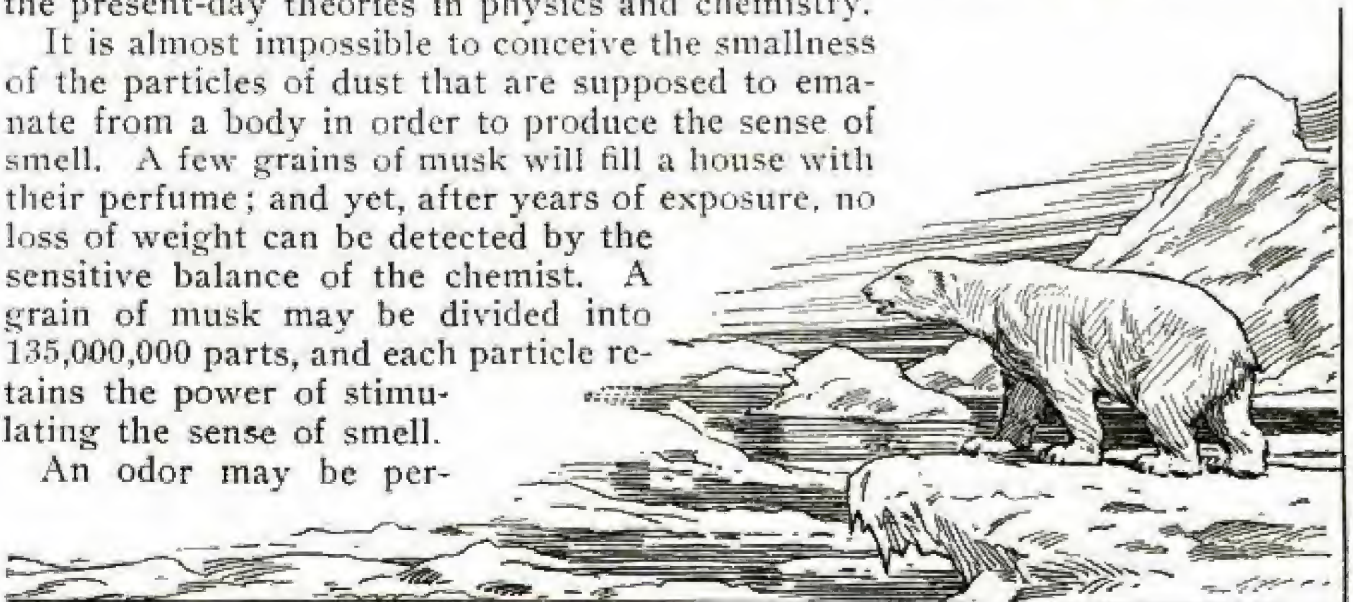
If the sense of smell is excited by vibrations of the ether, and not by material particles, then there are no perfumes or odors in the dust, even as light and heat are immaterial. It is a curious fact, however, that science has been compelled to reverse itself, over and over again. Certain facts, lately discovered, in regard to the properties of matter, would seem to indicate that light-producing bodies give off extremely small, swiftly moving particles, called electrons, comparable to Newton's corpuscles, moving at the rate of 60,000 miles per second, or, roughly, about one-third the velocity of light. It is not difficult to prophesy that the next decade will see changes in some of the present-day theories in physics and chemistry.

It is almost impossible to conceive the smallness of the particles of dust that are supposed to emanate from a body in order to produce the sense of smell. A few grains of musk will fill a house with their perfume; and yet, after years of exposure, no loss of weight can be detected by the sensitive balance of the chemist. A grain of musk may be divided into 135,000,000 parts, and each particle retains the power of stimulating the sense of smell.

An odor may be per-



In the Middle Ages the Burning of Incense had a Sanitary Significance



a Ship at a Distance of Seven Miles

ceived after it has been filtered through a tube containing cotton. The particles that are responsible for the odor, must therefore be less than the one-hundred-thousandth part of an inch in diameter.

As a general rule, the loss of any sense is commonly followed by an increase in the delicacy and perception of the other senses. Certain blind people have been known to have remarkable powers in the matter of smell perception. One instance is on record where an inmate of a large institution for the education of the blind was able to detect instantly the clothing of the other inmates, and to classify each garment with its owner's name, from the peculiar body smell it retained, even after it had passed through a vigorous cleansing in the laundry. It would follow from this that each of us has a certain definite odor, as distinctive as are the whorls on the balls of our fingers. Possibly our more enlightened descendants, in the dim future, will discard the present Bertillon system of finger prints and physical measurements in favor of a system based upon smells. Tiny vials, each containing the peculiar, distinctive smell of some offender against the majesty of the law, will be filed away in a great library of smells, for future reference.

Liegeois has stated that the smell of a corpse may haunt a living person for days, notwithstanding frequent washings and changes of clothes. Human odors are undoubtedly much heavier than the air that carries them, and do not readily diffuse. This accounts for the fact that a bloodhound keeps its nose close to the ground, when seeking the scent of its quarry.

Quite frequently the senses of taste and smell are confounded. We are familiar with the fact that a bad cold in the head makes it impossible to distinguish between small cubes of pineapple and similar cubes of potato, when taken into the mouth and chewed. We mistake perfumes for tastes. Physiologists tell us that there are only four tastes: sweet, sour, salt, and bitter. We are, therefore, indebted to the sense of smell for all the other so-called tastes.

It is likewise a fact that we must distinguish between the substances that excite the sense of smell, and those that simply irritate the olfactory membranes. Contrary to common opinion, ammonia gas has no smell whatever, but produces its well-known physiological effect by irritation. This is possible from the fact that the nerve ends, extremely fine and delicate, are naked and absolutely bare, not being covered with the mucous membrane as in the case of the nerves of taste.

The sense of smell in man is not as delicate as it is in some of the lower animals. It is quite likely that we miss much enjoyment thereby. We cater most strenuously to the sense of taste but neglect our opportunities as regards the cultivation and gratification of the equally important sense of smell. The perception of "flavors," as they are termed, is really due to the sense of smell, and has nothing to do with the sense of taste, as has already been pointed out.

Few of us know the names of more than 20 or 25 smells, even if we are able to distinguish them by our noses. The writer once entertained a party of 50 high-school students at his home, and somewhat at a loss to know what to do with them, decided that the evening should be given over to the detection and perception of odors and perfumes. Accordingly he placed about 60 small homeopathic vials each containing an essential oil or extract, such as bergamot, lilac, rose, violet, mustard, tobacco, geranium, mint cloves, bitter almonds, nutmeg, etc., in different parts of the house. The students were given paper and pencils and were required to write the name of each odor or perfume opposite the number on the card corresponding to that on the bottle. The result was interesting though rather disappointing. Not one of

the students named half of the smells, and 90 per cent of them did not recognize, or at least name, more than 20 of them, although the odors selected were, for the most part, quite common. The student who named the most also stood highest in her school work. Of course the test was not a fair one from the fact that the stronger perfumes prevented the perception of those more delicate. It is quite probable that a coating is produced on the membrane by the heavier oils, thus deadening it to the perception of the lighter essences.

The healing power upon the human body of certain perfumes, such as lavender, eucalyptus, rosemary, wintergreen, cloves, and eau de cologne, is undoubted. How many headaches have been banished by the timely use of smelling salts! No wonder our grandmothers gathered great bunches of lavender and other sweet-smelling herbs for household use. Most of the perfume-bearing herbs are not only pleasing to the sense of smell, but are likewise antiseptic in their properties. It has been proven beyond question that the perfume from certain herbs will destroy bacteria. In the middle ages the use of perfumes prevented many an epidemic, and the burning of fragrant incense in crowded cathedrals had a sanitary as well as a religious significance.

Possibly the time will come when these delightful ambassadors from the Kingdom of Dust will be given a more important position than they now occupy in the healing art, and mankind will learn to appreciate in a higher degree, the scientific value of the "Perfumes and Odors in the Dust."

THE NEW PIANO KEYBOARD

An Australian, Frederick Clutsam, has constructed a keyboard, which, contrary to the straightlined ones now in use, is slightly curved. On account of this the furthestmost keys are brought nearer the player and enable him to reach every key on the keyboard from his position without straining. The idea of a rounded or curved keyboard is not entirely new, but the

inventor has realized this idea in an absolutely new way. He also introduces a number of other novelties; for instance, the lengthening of the black and white keys by $1\frac{1}{2}$ centimeters ($\frac{1}{2}$ in.), the parallel running diminishing of all keys, the oblique ends of the black keys, and the slanting of the whole keyboard from the middle to the outer ends. The single octave which

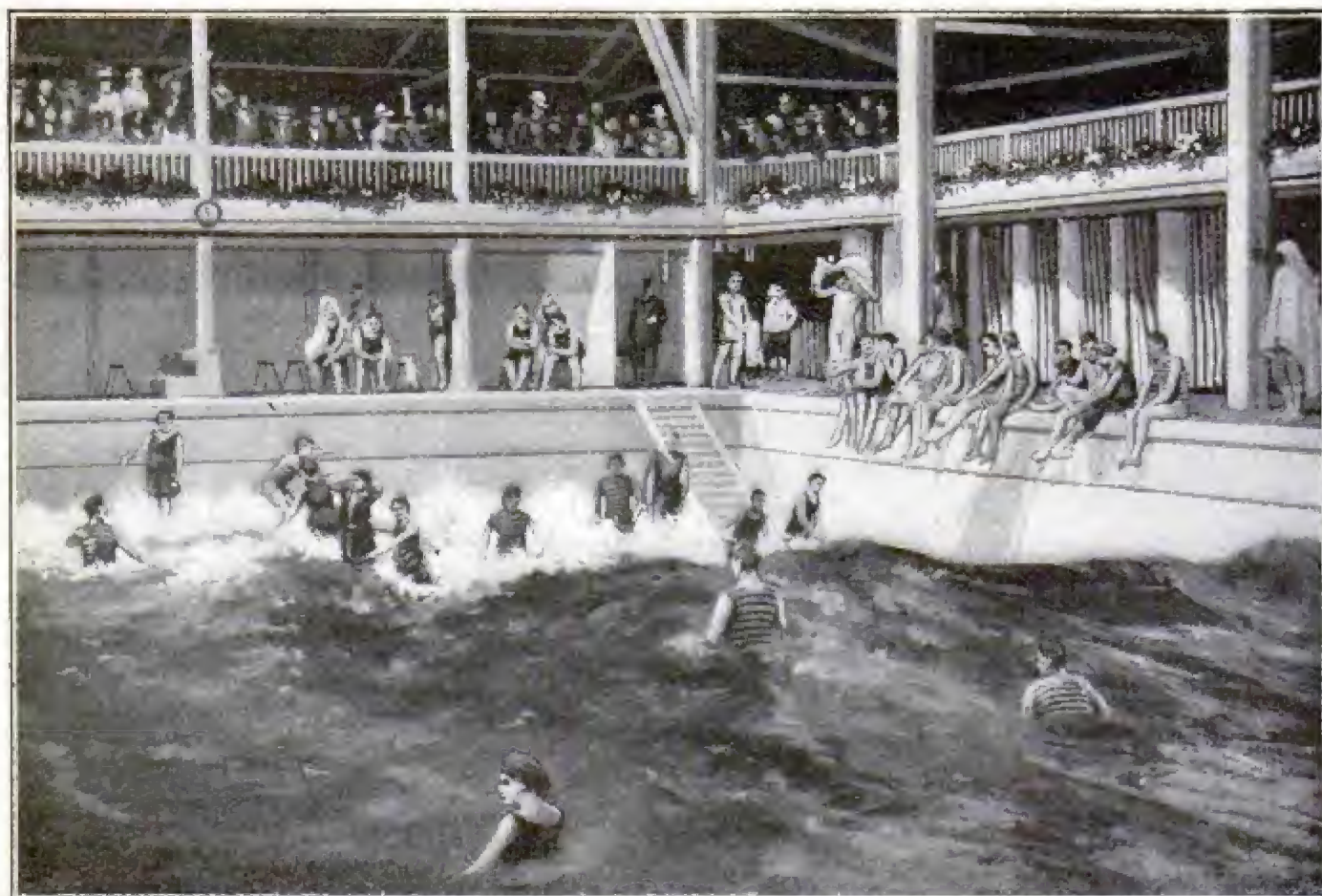


View of the New Piano Keyboard from Above, Showing Curve

is $1\frac{1}{2}$ centimeters ($\frac{1}{2}$ in.) shorter than the old one, greatly lessens the stretches, the narrower keys affording a longer grasp. This is especially invaluable for small hands. The player can always sit straight, and the position of the hand is always anatomically correct, without any wrenching or uncomfortable movements of the arm. The piano literally comes towards one, whereas up to now, the fingers, hands

and arms have struggled against it. Each key of the piano is easily reached during the absolutely unchanged natural position of the body and each is struck with the same force.

Till now the new keyboard has simply been built and placed into the old pianofortes. The construction of the keyboard itself has, of course, no influence upon the tone quality of the pianoforte.



Courtesy London Sketch

Bathing in the Artificial Surf of a Swimming Tank in Dresden

SURF IN A DRESDEN SWIMMING BATH

An excellent imitation of a surf at a seaside bathing place has been provided mechanically for the patrons of a swimming tank at the International Hygiene Exhibition held in Dresden. The waves, caused by means of special apparatus operated by steam, are made to roll from end to end of the tank, and at the shallow end of the tank they break like the surf on a beach.

AIR HOSE AS SHALLOW-WATER ALARM

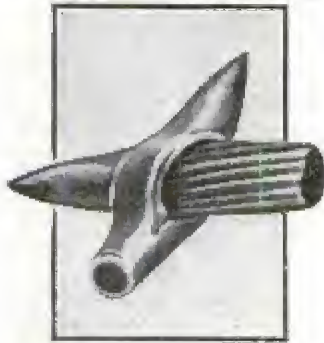
A shallow-water alarm for ships, recently tested out by freight steamers on the Great Lakes, consists primarily of a line of armored rubber hose, 300 ft. long, and having a $\frac{1}{2}$ -in. bore. This line of hose is arranged to trail beneath the vessel, and air is forced through it from a compressor and reservoir.

When the vessel so equipped is moving through the water at 14 miles an hour, the end of the line is, by reason

of its inclination, 60 ft. below the surface of the water, and thus for all depths of more than 60 ft. the indication on the gauge located in the pilot house is 60 ft. with no bottom. The pressure required to force the air through the hose, however, varies with the depth at which the free end lies, and the gauge in the pilot house records the variations when the depth becomes less than 60 ft. and the hose is dragging. The readings on the gauge are calibrated to give the depth in feet directly.

STONE-AGE PICK, OR WHAT?

At first glance, and after many repeated glances for that matter, few readers would hesitate to pronounce

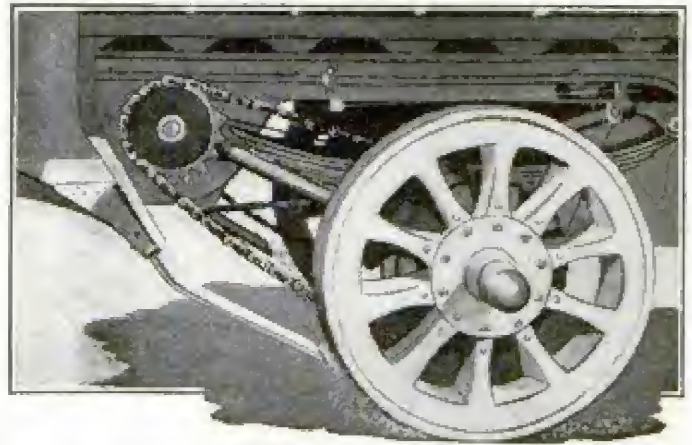


the object shown in the illustration, some implement from a prehistoric period. It is nothing but two rifle bullets, however, one having by chance penetrated the other.

The two bullets were found, exactly as shown, on a rifle range, near Grenoble, France, during a recent international shooting match. The pierced bullet, which is of lead, had first become imbedded in the butt behind a target and the other, which is of a new type and copper-covered, had penetrated it without any appreciable deformation to itself.

SAND AIDS TRACTION OF STEEL AUTO TIRES

A preference is being shown in French army service for motor trucks equipped with steel tires, but the manufacturers are moving very cautiously toward the abolition of rubber, as the use of steel tires necessitates extensive changes in chassis design. One manufacturer has modified its truck in making the change so as to carry the motor

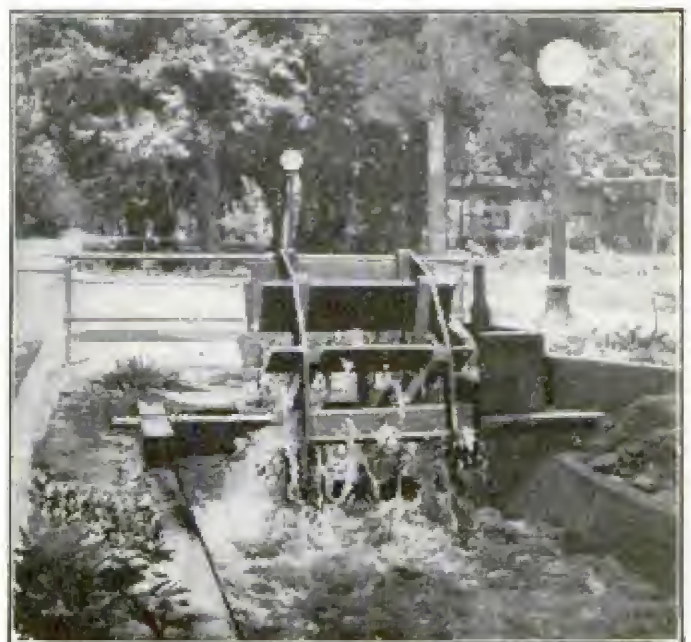


Steel-Tired Motor Truck has Sand Box

and gear box on a subframe attached to the main frame through a series of coil springs. Still another provides a sand box of a type similar to that used on electric cars, the sand giving the drive wheels better tractive force on wet or slippery surfaces.

IRRIGATION WATERWHEEL IN CITY STREET

A large waterwheel, placed by the city in an irrigation ditch on Naches avenue, one of the most exclusive residence streets of North Yakima, Wash., aroused a storm of protest at first because of its incongruity and its continual splashing day and night. Later, the residents who complained were informed that the wheel was put there



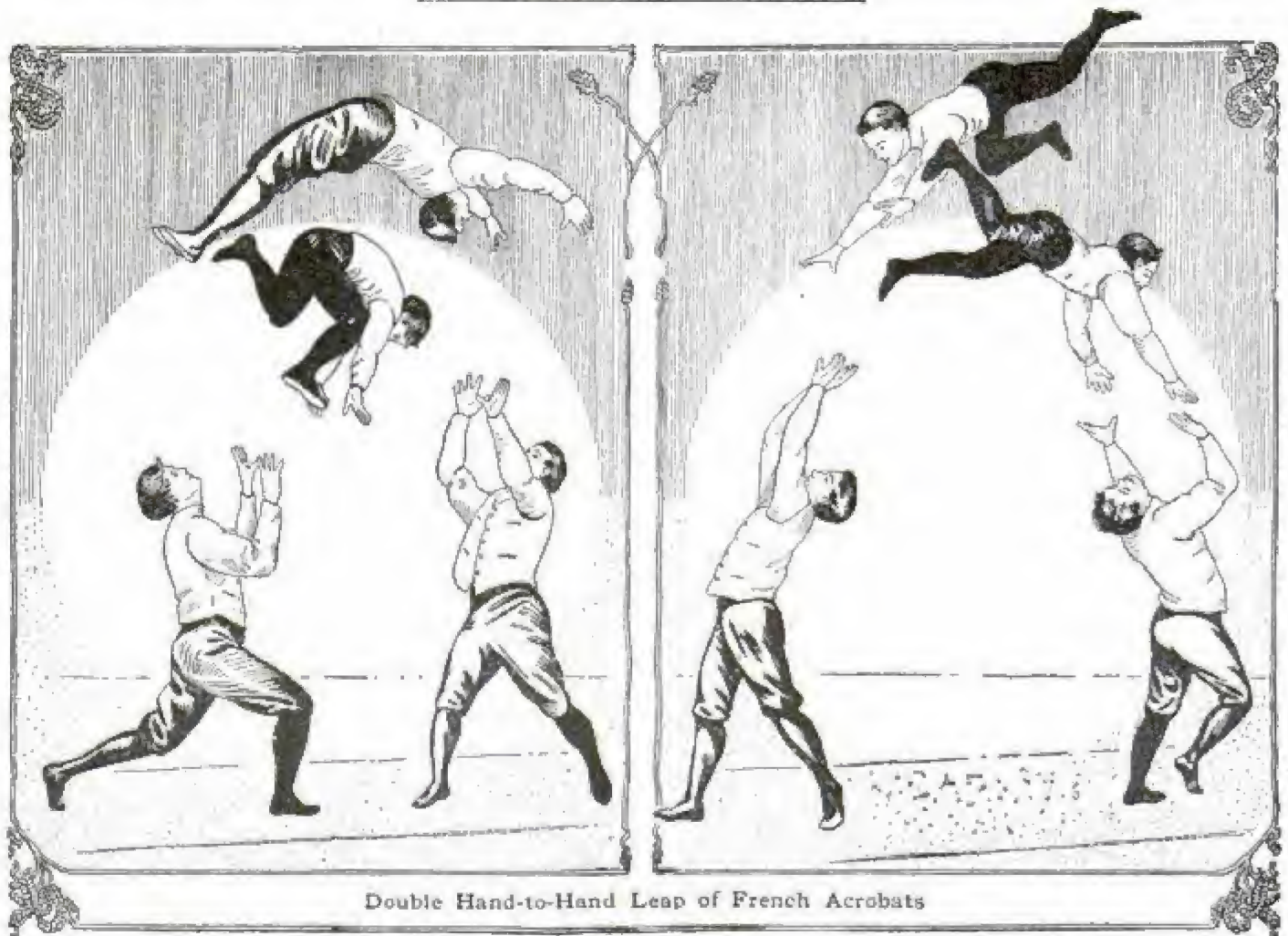
Waterwheel in Irrigation Ditch in Street of Western City

to raise water from the ditch, to protect the water rights of a property owner on the outskirts of the city. The placing of the wheel was necessitated by a change of grade at the time the street was paved.

The wheel was constructed as a model of its kind. It is strongly built, with broad paddles, operated by the current of the water in the ditch. On alternate paddles are long sheet-iron cups open at one end. The open end,

slightly elevated when the paddle is in the stream, takes its load of water, which is discharged into the catch box when the paddle approaches the top, and the open end of the cup is depressed.

Inasmuch as the avenue is much frequented by people on pleasure drives in automobiles and carriages, and is visited by all strangers in the city, the waterwheel promises to be a feature of the avenue instead of a nuisance.



Double Hand-to-Hand Leap of French Acrobats

DIFFICULT FEAT OF FOUR FRENCH ACROBATS

An acrobatic feat of unusual difficulty and daring is being shown in Europe by a quartette of gymnasts. Two members of the troupe balance themselves with their hands in the hands of the other two members, the two men underneath standing some distance apart back to back. At a given signal the two men held in the air leap from their human pedestals, changing places, the feat ending with the four men in the same positions as at the

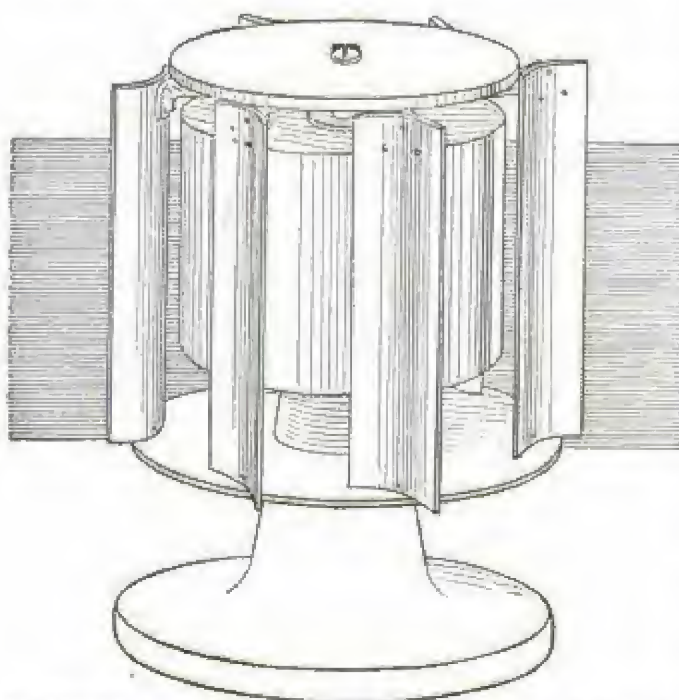
beginning except that the one who was held aloft by the man on the left is balanced on the hands of the one on the right and the man on the right is now on the left. In performing this feat the two acrobats pass each other in midair. After presenting it with the two men underneath standing back to back, they turn around and face each other and the acrobats again make the leap, each returning to his former perch.

WESTERN RAILROAD HAS PINK ROADBED

The section of a western railroad traversing the Siskiyou mountains in Southern Oregon and Northern California, is gaining the unique distinction of having a pink roadbed. The company recently uncovered a deposit of pink volcanic ash in these mountains, and found it a splendid material for ballast. Great quantities of it are now being used in surfacing the road, and the bright, pinkish coloring is adding greatly to the attractiveness of the route.

VERTICALLY MOUNTED TABLE FAN

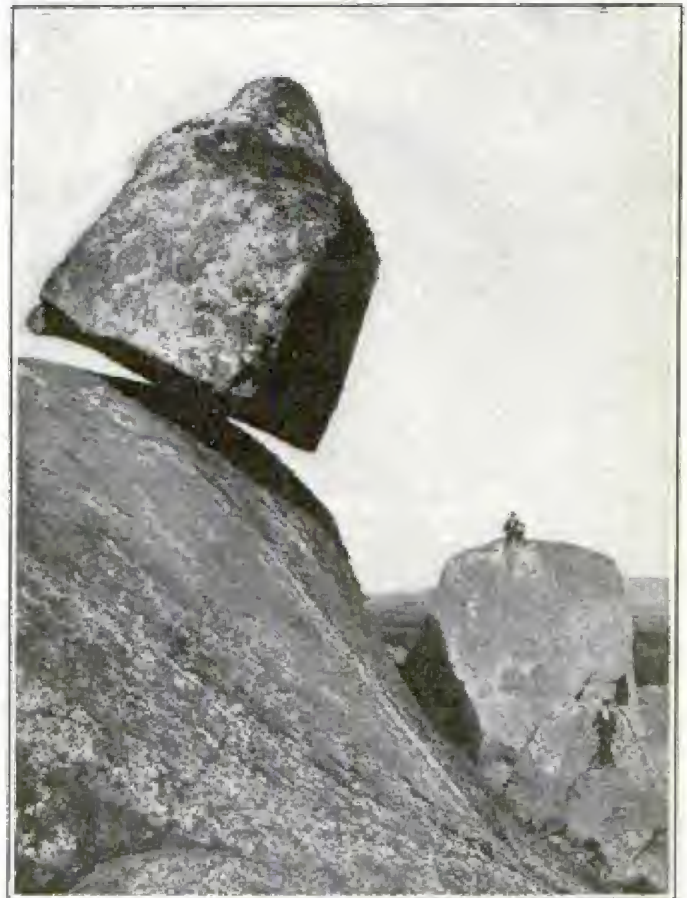
This vertically mounted fan has just been brought out which is specially designed for use upon the dining table. It is 9 in. high, 7 in. in diameter, and the entire blading and rotating parts are protected by a bell-shaped wire meshing. The disposition of the blading is such that each person at the table receives the breeze, and the usual discomfort of having the air thrown at full force against one person while another is receiving little or no benefit, is obviated.



An Electric Fan for Table Use, Which Throws a Radial and Not Too Forceful Breeze to All Points of the Compass

THE ROCKING STONE OF ARGENTINA

About 270 miles south of Buenos Ayres, in the Sierra Tandil range of mountains, is a 700-ton rock so deli-



Courtesy The Sketch, London

A 700-Ton Stone Which Looks Every Moment as if About to Fall, Yet may be Gently Rocked

cately poised that it can be rocked gently enough to crack a walnut without crushing it. It looks as if every moment it were about to fall. Its surface, and that of the surrounding rocks, is carved all over with the names of tourists.

SLOT MACHINE REGISTERS LETTERS

Penny-in-the-slot machines for the sale of postage stamps have met with favor, and now an automatic machine is being produced which registers letters. It has a door which flies open when two pennies are inserted, revealing an aperture in which the letter is placed. On the turn of the handle the letter, duly registered and numbered, is thrown out at the side, and a receipt is returned at the front of the machine.

RAILROAD TRAILS THIEVES WITH BLOODHOUNDS



Getting the Scent from Sack Touched by the Thief

The Long Island Railroad has a kennel of seven bloodhounds, which have been trained to trail the class of thieves who prosecute their calling in railroad freight yards. To keep the dogs on edge, an imaginary thief chase is instituted every few days, one of the railroad employes taking the part of the thief. The dogs are first led to



Following the Trail of the Thief

something the thief has touched and from this they get the scent. If started on the trail soon enough, they very seldom fail to follow the scent.

PURE-FOOD REGULATIONS IN ANCIENT TIMES

That pure-food inspection and regulation is not an idea of modern times, but existed several thousand years ago is clearly shown by many records. Records of pure-food labels and bonded warehouses as far back as 2,700 years are available in bits of pottery containing Hebrew writing of 850 B. C., discovered by Prof. G. A. Reisner of Harvard University during excavations made in Palestine. These bits of pottery were tablet labels for wine and oil jars, and on them are writings giving the year in which the wine was laid down in the cellars of the palace storehouse, and the names of the vineyards from whence it came. The oil-jar labels stated "A jar of pure oil," mentioning the district from which it came.

Records of frauds practiced by the bakers of Naples about 61 A. D., in mixing a white earth with the flour, are available in written documents, which also show that, at about the same time, even the rich of Rome were unable to obtain the unadulterated wines of Falerno. The city of Athens had its special wine inspector.

France had a statute forbidding the adulteration of beer as early as 1292, and sampling from the original package was recognized in 1371, when a decree of the Provost of Paris compelled tavern keepers to permit a purchaser of wine to see it drawn from the original cask. An ordinance of 1330 forbids the mixing of wines and the giving of a false name or false age. In 1444, penalties for adulteration were such that records of second offenses do not exist. In that year an adulterator of saffron was burned alive, his

adulterated saffron being used as a fuel.

Adulteration of foods or drugs was punishable, in many countries during the Middle Ages, with mutilation and capital punishment.

MOTOR-TRUCK MOVES CHURCH

Trinity Methodist church, Knightville, South Portland, Maine, a two-story structure, 82 ft. long and 32 ft. wide, was recently moved back several

of more or less serious accidents, the elimination of which does not seem impossible.

Attention is also called to the fact that the Nieuport monoplane is as fast and perhaps faster than the Blériot, both being equipped with the same power and make of motor, although the latter has considerably smaller wing surface, the difference being that the Nieuport has its wings adjusted to a lesser angle of incidence or attack on the air than the Blériot. This, in view of the many remarkable performances



Church 82 Ft. Long by 32 Ft. Wide Drawn Back from the Street by Automobile Truck Hauling on Block and Tackle

feet from the street by means of block and tackle, the motive power being a large automobile truck. The truck was loaded with heavy railroad ties to give it the required tractive power, and although the field over which it had to run was soft and sandy, it accomplished its task without trouble.

URGE STUDY OF TECHNICAL PROBLEMS OF AVIATION

The necessity of studying the important technical problems in the art of flying is advocated with increasing emphasis by European aviation journals.

It is pointed out that the frailty of the landing chassis is a frequent cause

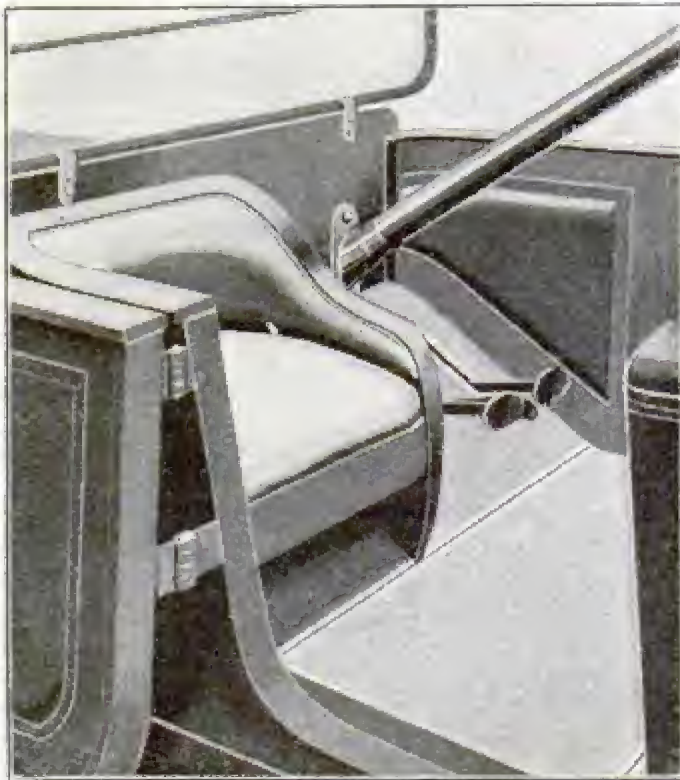
of the Nieuport machine this season, would tend to indicate an advantage of large sustaining surface combined with slight angle of incidence over smaller surface and greater angle. Further, the difference in speed between a Nieuport equipped with 100-hp. Gnome motor and the same equipped with a 28-hp. Nieuport motor is not as considerable as one would naturally expect, depending, perhaps, on the propellers used and also on the greater head resistance of the stronger motor.

None of these questions have, however, been exhaustively studied by competent experts; and there is no doubt that the solution of these and

many other technical problems would furnish a safer basis for aeroplane construction in the future and further its development into a safe and practical means of locomotion much more effectively than any number of competitive meets and exhibitions.

"JUVENILE" SEAT FOR AUTOMOBILES

One of the 1912 automobile models has a small seat occupying half of the section back of the dashboard in the



One of the 1912 Models Has a "Juvenile" Seat Up Against the Dashboard

driver's section of the car. It is designated as a "juvenile" seat, and would provide only rather tight quarters for an adult.

FIRE-DAMP RINGS ALARM BELL

Two chemists of Sydney, New South Wales, have invented a device which gives warning either by a bell or by the flashing of a light when fire-damp is present in a mine.

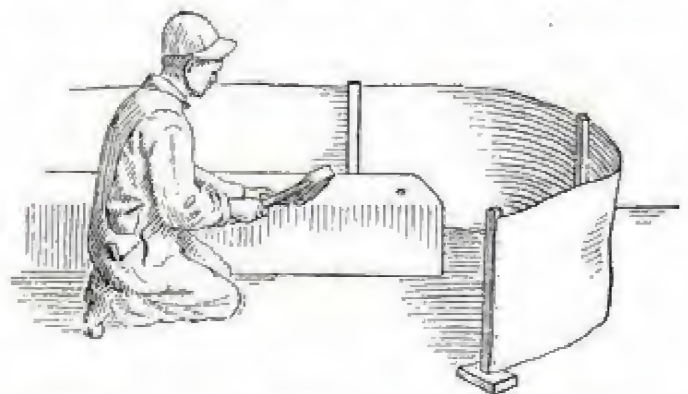
The apparatus consists of a piece of glass tubing bent into U-shape, with the lower curve flattened. One leg of the U has a funnel at its upper end,

the mouth of which is covered by a thin disk of plaster of Paris, mixed thin, so that it is porous when dry. The other leg is crowned by a small reservoir containing mercury, with a little tap to allow the metal to be run into the bent tube below. Through the lower part of each leg is passed a fine platinum wire, that of the funnel-topped leg being about $\frac{1}{2}$ in. below the level of the other, and immersed in mercury, which fills the bend of the U up to this level. The wires are connected to the poles of an ordinary battery.

When the device is brought into the presence of a mixture of gas and air, the gas permeates the plaster-of-Paris seal and depresses the mercury. This causes the mercury in the other leg to rise. Thus a contact is made with the platinum wire just above, the circuit becomes complete, and either the bell or the colored light is set in operation. It is said that the apparatus can be adjusted to give warning of the presence of as small a proportion as two per cent of gas.

SCREEN AS A PROTECTION FROM STONE CHIPS

In European cities, when a stone mason is at work dressing a slab for a curbing or chipping a curb or a part of the sidewalk, the authorities require him to erect a screen of fine wire mesh



European Stone Masons Work Behind Screens to Protect Passers-By

or canvas around his work to prevent stone chips flying about the street and possibly injuring people passing by.

TRANSFORMING GOLD-DREDGED LANDS INTO ORANGE ORCHARDS

How the Top of the Earth for a Depth of Forty Feet is Turned Upside Down by Huge Floating Gold Dredges—Vast Plateaus of Cobbles are Being Ground Up and the Land is Leveled and Planted Again

By HAMILTON WRIGHT

UP IN the foothills of the Sacramento Valley that lies between the coast range and the Sierra Nevada Mountains thousands of acres of gold-dredged lands, comprising huge plateaus of stones from 15 to 30 ft. above the normal level of the earth, will be graded down and planted to orange, olive and other orchard trees and to eucalyptus trees.

Young trees planted in the once devastated territory are thriving. The experts find that weeds are unknown on the dredged lands, that plowing is unnecessary, for the lands have already been plowed 40 ft. deep, and that only a minimum of moisture is required. Irrigation is almost superfluous for the land is a reservoir.

A gold dredge is the most voracious thing in existence. It eats up from 5,000 to 10,000 cu. yd. of earth a day, and sifts all the gold out of the soil with a loss of only 10 per cent of the total gold in the ground. It turns over the top of the earth between bedrock and the surface, an average depth of 40 ft., though dredges have worked down as deep as 84 ft., and, last, but by no means least, it automatically separates all the stones in the ground so that after a dredge has passed through a certain area the soil is all on the bottom and the stones on the top. The stones being separated occupy more space than when they are in place in the soil and the path of a dredge consists of huge irregular plateaus of cobble-like stones sometimes several miles in length and almost a mile wide.

When a dredge has eaten its way through a bit of territory the country looks far worse than if a Kansas cyclone had passed that way. Most of the territory dredged is in worthless

land along the American river and not far, as the crow flies, from where James W. Marshall first discovered gold in California. Marshall found the first nugget of gold in the tail race of a grist mill on Jan. 24, 1848, and since that time the country has been prospected intermittently by placer miners and by solitary men, who cooked their own "grub" and went to the nearest town once a month to "cash in." From 'forty-nine till the early sixties the placers tore great gashes in the red earth and today there are huge pits where the giant nozzles melted the land away. But it was not until the gold dredgers came, about 10 years ago, that a scientific and highly commercial method of extracting 90 per cent of the total gold between the top of the ground and bedrock was devised. So successful is the gold dredge that most dredges are now operating through ground that was incompletely worked out by the placer miners in 'forty-nine.

For several years after the dredging industry had gotten well under way the dredging companies found they would be put to an immense dead loss in removing or leveling the enormous pyramids left by the dredges. Residents of the dredging districts protested against the havoc. The operators started to work leveling but it was a costly business; thousands of tons of stone had to be carted away. Finally a bright young engineer hit upon a plan which made him both rich and famous. "Why not crush these rocks," said he, "and use the crushed rock for asphalt roads and concrete work." Tests showed that the plan worked well. Accordingly three huge rock-crushing plants were erected at Natoma, Fair Oaks and Oroville, the principal gold-dredging centers. These



Three-Year-Old Hardwood

have a combined capacity of 4,500 tons of rock a day or more than 1,500,000 tons of rock a year. They ship away rock by the trainload and it takes the crushers a year to eat up 30 acres of rock.

After the surface rocks were devoured by the crushers down to the point where the rocks and soil merge,

the bright young engineer had another practicable idea. "Why not keep on getting something out of this land?" he thought. So the land was leveled and fast growing hardwood trees, imported to California from Australia, were planted. In three years the first grove of trees have reached a height of 18 ft. They have never been irrigated



A Plateau of Stones, a Mile and



Trees in Dredged Land

and there is not a weed in the grove. Other dredging men caught the same idea. Olive trees and orange trees were set out at Oroville and with good results. Even pasture land was found good for fruit after it was dredged. At Natoma there are three big groves of hardwood trees, one, two and three years old. The land would not have

brought a dollar an acre before it was planted but now \$100 an acre wouldn't buy it.

There are 25,000 acres of dredgeable gold-bearing land in California; an average return from dredging of \$10,000 an acre. Most of the land is controlled by corporations and, with \$250,000,000 "in sight," all the land will be dredged



a Half Long and a Mile Wide



No. 8, the Largest Dredger in the World, at Work in

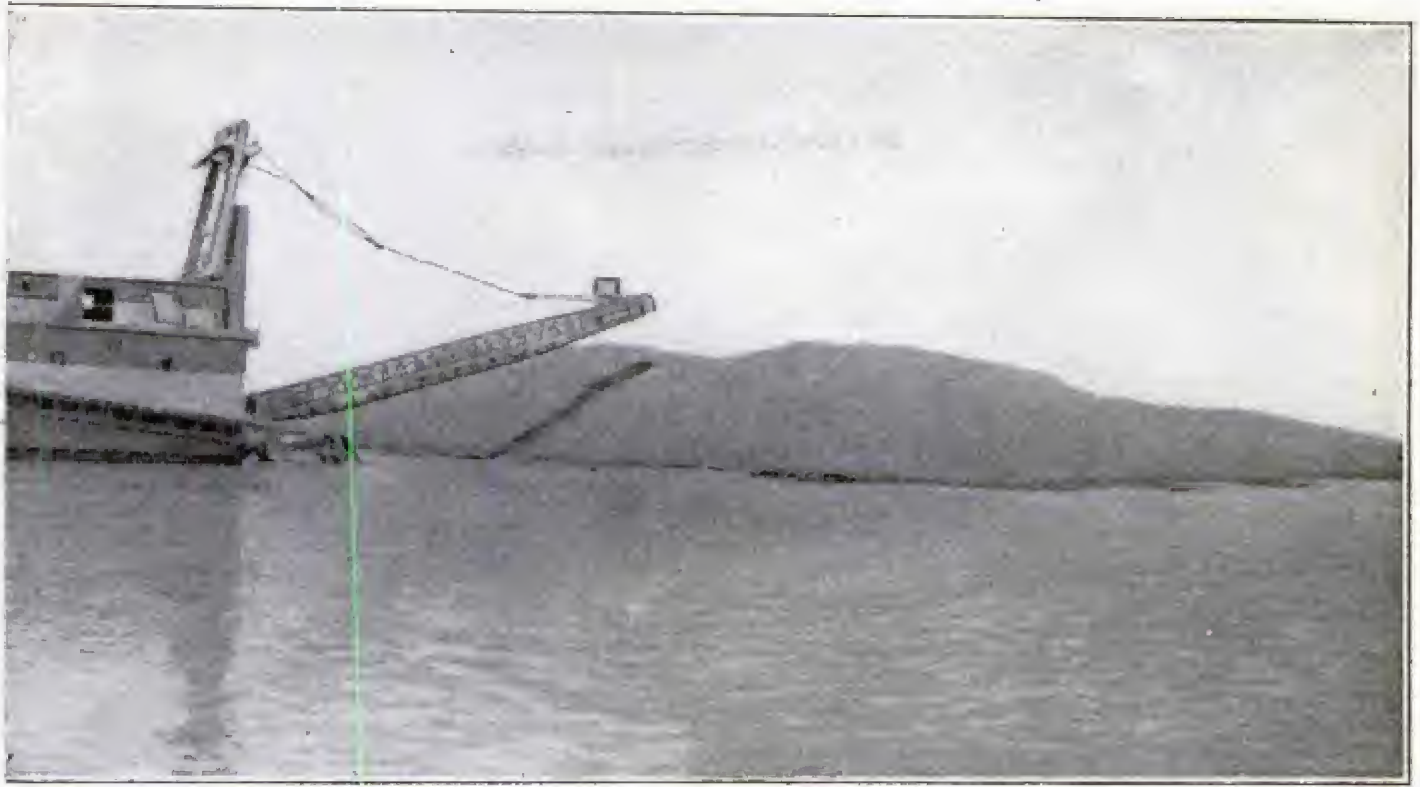
at as rapid a rate as will assure the largest production of gold. Around Oroville the dredges gophered their way through orange orchards but the operators had the right to dredge their own lands and fruit ranchers could not resist the fancy prices offered. So the despoliation went on until a way of settling the problem was found. The

only ultimate solution was to grind up the rock, for though some of it can be hauled away there will be billions of tons of it before the land is all dredged.

A gold dredge is the slowest boat in the world but its progress is irresistible. It may go up or down hill digging its own locks, as it were, and in four months with good ground it will



A Rock-Crushing Plant That Breaks Up the Stones after



an Artificially-Created Pool, Near Folsom, Cal.

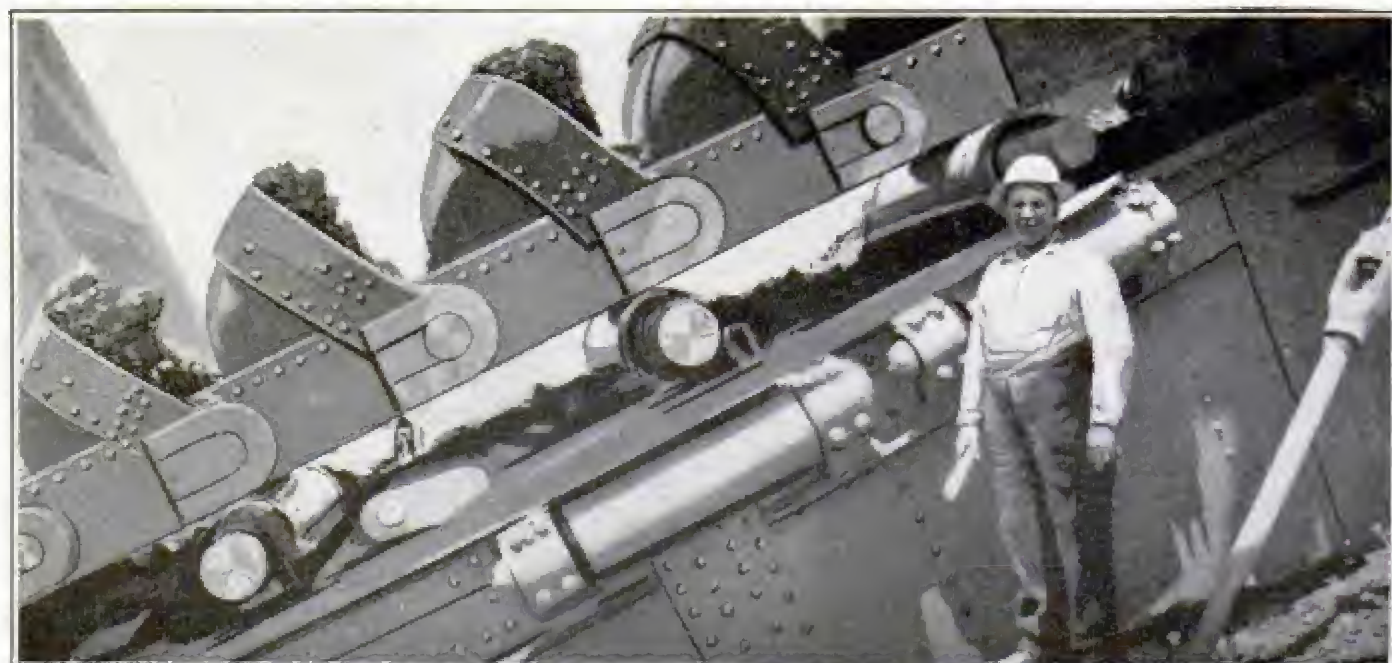
travel half a mile. In the gold districts the dredges often operate far from any stream although water is absolutely essential to their working. No. 8, the largest dredge in the world, operating near Folsom, Cal., is more than two miles from the nearest water, but it floats in a pool 72 ft. deep. This dredge, like others, was built in a hol-

low at the place of its working and the water to supply it is provided through an irrigation ditch.

Four men comprise the entire ship's crew of a dredge, the "Captain," one man at the levers and two men for oiling and general cleaning up around the boat. All dredges are run by electrical power generated by Sierra



the Gold Dredge Has Put Them on Top of the Ground



Buckets of Dredge No. 8 at Folsom, Cal.

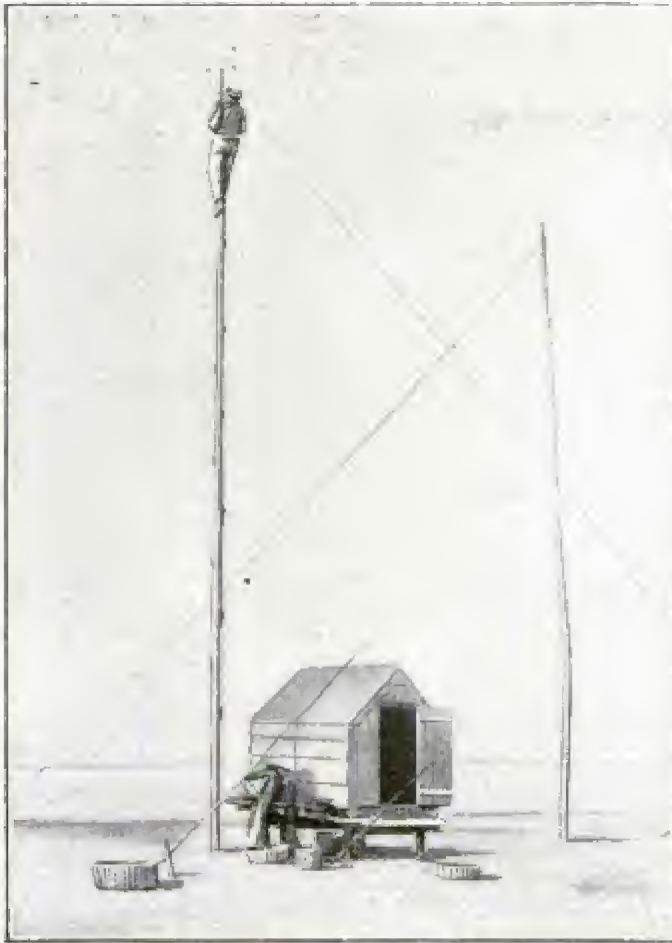
streams. No. 8 requires 400 horsepower and its entire mechanical working is directed by the man at the levers who works in a room like the pilot house of a Mississippi river boat.

The havoc wrought by a dredge is explained by its method of operation. In dredge No. 8, the buckets that scoop up the earth from beneath the water have a capacity of 15 cu. ft. each and are set 3 ft. 6 in. apart, in an endless chain. They move at a speed of 54 ft. a minute. In 21 hours if the buckets are filled to their exact capacity the dredge would handle something over 10,000 cu. yd. of earth. When the chain of buckets traveling on an inclined plane, called the upper tumbler, reach the top of the dredge, in turning they discharge their contents, soil, stones and all, into a huge cylindrical hopper. From the hopper the contents pass into a huge revolving screen that pitches from the top of the dredge to the stern at an angle of $1\frac{3}{4}$ in. to the foot. From the time it leaves the buckets the ground is constantly played upon by water so that all the soil and sediment escape from the screen and is carried in suspension by the water over the riffle boards. The riffle boards are merely a series of detachable slats with spaces in between where the gold lodges and amalgamates with quicksilver. After the water carrying

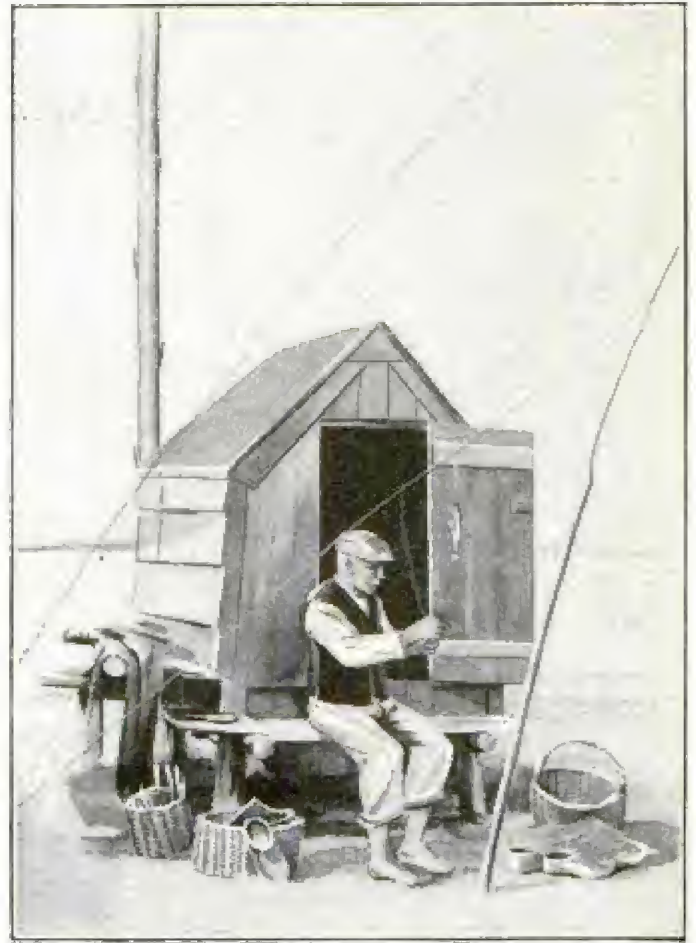
the gold, soil, and fine gravel has passed over the riffle boards it escapes by the stern of the dredge where the sediment settles and makes new ground. The stones on the other hand do not escape from the screen but, thrown around with terrific din as the screen revolves, they finally land on the traveling belt at the stern of the boat, where they are carried high up and far beyond the stern and drop on the newly made ground. So it is that the stones are on top and the ground beneath.

But at a varying depth the soil and stones merge. Here the land is leveled at about its former level and set out in trees. The success of the unique experiment and the future possibilities of dredged lands are borne out by a wealthy rancher of Oroville, Cal., who, for the past three years, has been experimenting in the reclamation of dredged lands for horticulture.

"A lazy man's way to grow fruit with a capitalist's returns," is the way in which he describes fruit growing upon dredged land. To begin with, there is no plowing to be done, for in mining the ground the dredger has literally plowed it for a depth of 40 ft. Neither are there weeds to be hoed, for weeds do not thrive on a surface area of clean washed gravel and cobbles.



The 50-Ft. Poles of Long-Distance Fishing Apparatus Used on the Gulf of Biscay



Unhooking Fish Caught 1,700 Ft. Out to Sea

LONG-DISTANCE FISHING IN FRANCE

The French fishermen on the Gulf of Biscay practice a peculiar method of fishing by which the hooks are baited and the catch removed from the line about 1,700 ft. from the point where the fish are caught. The apparatus required for this long-distance fishing includes a pole about 50 ft. high on the shore and a similar pole about 1,700 ft. out in the water. The shore pole has pulleys mounted both at the top and at the base, and the sea pole has a pulley at its top. Over these pulleys is stretched an endless line to one section

of which are attached a number of fishing leads spaced about 30 ft. apart. After baiting the hooks on these leads, the fisherman hauls on the endless line until they are away out to sea, and then gives the bait motion by continuously jiggling the endless line, thus causing the bait to jump on the surface of the water. The catch often totals as much as 175 lb. a day. The season lasts from the beginning of August to the end of September, and the fishermen live in little cabins at the foot of their shore poles.

SCIENTIST ONCE "PROVED" MAN-FLIGHT IMPOSSIBLE

Do you know it is a mathematical impossibility for man to fly?

A strange inquiry to make at this stage of the world's progress when the whirr of the aeroplane propellers echoes around the world and the news-

papers are filled with paragraphs, long and short, that tell of the feats of men who pilot heavier-than-air machines at cyclonic speed and to bewildering altitude! Yet it is made on the authority of one of the most eminent scientists,

Prof. Joseph Le Conte, who took the trouble to work out in pure mathematics the answer to the riddle of the air. True, the problem was "solved" by Prof. Le Conte more than 22 years ago, but his deductions were not founded on theories or fanciful prospectuses. He dealt in cold scientific facts and figures. His idea was to save the lives of a number of experimenters and guide into useful channels what he thought to be valuable, though misdirected, thought and energy. The conclusions of the professor are valuable in that they show without embellishment the plain state of scientific mind of his day and hour—a state of mind, it might be said, that continued to prevail for almost twenty years after his "exact" reduction of the problem to mathematics. The number of people who held different ideas in 1888 formed a minority so meager as to be microscopic when compared with the great mass of the world's inhabitants, and they were set apart from their fellows as being "queer," "cranks," or candidates for an insane asylum. Ten years ago, the minute a man mentioned the fact that he was engaged in the construction of a flying-machine, he was set down as a mild sort of lunatic. Many of the "aviation experts" of today who claim encyclopedic powers in their acquaintance with the why and wherefore of aeroplanes, are men who cried loudest and laughed longest at Langley, Chanute, Lilienthal, the Wrights, Santos-Dumont and Farman.

Prof. Le Conte was at least honest in his belief and humanitarian in his purpose. This makes his deductions all the more interesting at this time. He was sure he was right and proved it, not only to his own satisfaction, but to that of practically every student and layman in the world. What he found by his investigation he set forth in these terms:

"I am one of those who think that a flying machine is impossible, in spite of the testimony of the birds. . . . I wish now to give, very briefly, a reason for my faith. I can best do so

with brevity and clearness by a series of propositions which I hope will lead us, step by step, to absolute demonstration. I believe this important to check baseless expectations and limit effort to right direction.

"The strength of a muscle increases as the square of any lineal dimension, while the weight of a muscle increases as the cube of the lineal dimension. Hence it is that the weight of an animal increases with far greater rapidity than its strength increases. A flea's muscles are not stronger than those of an elephant, as has been inferred, because it can leap farther in proportion to its size. The slight weight of the flea relative to its muscular strength accounts for its astonishing ability as an insect acrobat. Nature reached its possible limit in the evolution of a walking animal when it evolved the dinosaur of the Jurassic period. The whale probably passed this limit and was compelled to take to the sea in order to move about at all. In like manner, nature reached her limit in flying-machine size when she evolved the condor and the bustard, whose weight is about 50 lb. Larger birds, like the ostrich, are too heavy to fly. If nature has reached her limit in developing a flying-machine weighing 50 lb., man cannot expect to do better. Man never has done better than nature in point of efficiency, even with his best steam engine. The animal body, in fact, is about twice as effective as the best Cornish engine. No machine that we may hope to devise, for the same weight of machine, fuel and directing brain, is half so effective as a bird."

In conclusion, Prof. Le Conte inquired: "Is it not demonstrated that a true flying-machine, self-raising, self-sustaining, self-propelling, is physically impossible?"

¶ There are more wooden shoes worn in Chicago, New Holland, Mich., or Grand Rapids, Mich., than in the city of Amsterdam, Holland, according to a United States consular report.

CHINESE BUILDING UNIQUE BATTLESHIP

One of the most complete of modern naval training ships is being constructed in England for the Chinese navy, and will serve henceforth as the school ship for aspiring officers of the Celestial Empire's fleet. The vessel was launched recently, the launching attracting little attention, although the builders believe the vessel to be one of the most remarkable they have turned out. The feature that makes it different from the ordinary warship is that while it is of small tonnage—2,400—and has a draft of but 13 ft., it has aboard every variety of appliance to be found on the biggest of the dreadnoughts. Of course the armament of the little ship is not to be as heavy as that of a battleship, but the construction and equipment are such that an officer graduated from its decks will be fully acquainted with the working of a dreadnought and can navigate the big ship as successfully as he could navigate the one on which he received his training. The boat will be 330 ft. long and will have a breadth of 39 ft. Her speed will be 20 knots and her armament will include a variety of guns, the largest being 6-in. and the smallest 1¼-pounders. There will also be 4-in., 14-pounders and 3-pounders. This will make the vessel a very formidable fighting ship. There will be different types of boilers on board, cylindrical and water-tube, so that the engine-room force and stokers may get experience in handling the different types. There will be two 18-in. deck torpedo tubes, and an unusually large quantity of ammunition is to be carried in the extra size magazines.

STOOLS AS BACKS FOR STOOLS

The only seating accommodation provided on certain of the decks of many of the Hudson River and other excursion steamers of New York as well as ocean steamers, is the backless folding type of stool shown in the accompanying illustration, which also



Ingenious Method of Making a Second Stool Serve as a Back-Rest, Adopted by Passengers on New York Excursion Boats

shows an ingenious means of combining two such stools to provide a restful back. The stool to be used as a seat is placed near the rail, and a second stool is hung in the wire netting of the railing as shown. Only the two upper legs of the stool used as a back-rest need be fitted into the wiring.

VEDRINES' SAFETY BUFFER

Just forward of the driving seat on his monoplane, M. Vedrines, one of the famous French airmen, has arranged a pneumatic buffer to act as a safety device. Should his machine strike heavily in alighting, it would be against this section that the airman would be thrown.



Pneumatic Buffer Immediately in Front of Driving Seat of M. Vedrines' Monoplane

ANCIENT RUINS MADE TO ORDER

A remarkable imitation of ancient ruins has recently been completed at

Peter's church. The ruin is built of concrete blocks, ingeniously shaped and treated in places in a manner which aids in giving the whole an ancient appearance. The design of the ruin was copied from drawings made of it when it was actually in the condition now reproduced.



Making an Ancient Church Ruin Out of Modern Concrete Blocks

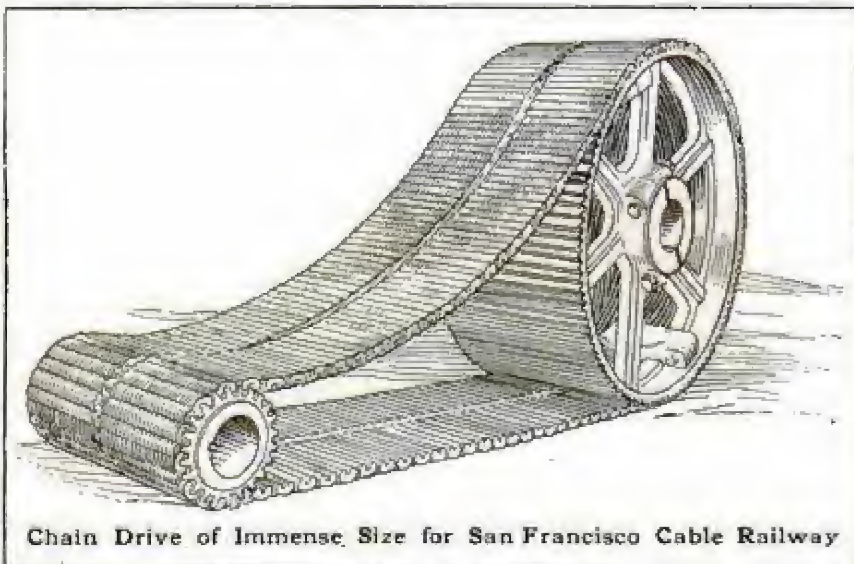
South Bank, Norton-on-Tees, England, in the form of an entrance for St.

and towers. The neighborhood immediately named it "Sham Castle."

GIANT CHAIN DRIVE

One of the largest chain-drive transmissions of its kind in the world was recently installed in the plant of a San

Francisco street railway as an important part of the new machinery required in the substitution of electricity for steam power in operating the cables. The bulk and high cost of a slow-speed motor for operating the cable made its use practically impossible, and the high-speed motor decided upon required an exceptionally large speed reduction. The ordinary methods of transmission, such as belts and ropes, were found to be impracticable under the conditions, so the chain drive shown in the illustration was chosen.



Chain Drive of Immense Size for San Francisco Cable Railway



One of the Workshops of the Geophysical Laboratories in Washington

ROCKS AND MINERALS MADE BY ARTIFICIAL MEANS

By L. WILLIAM THAVIS

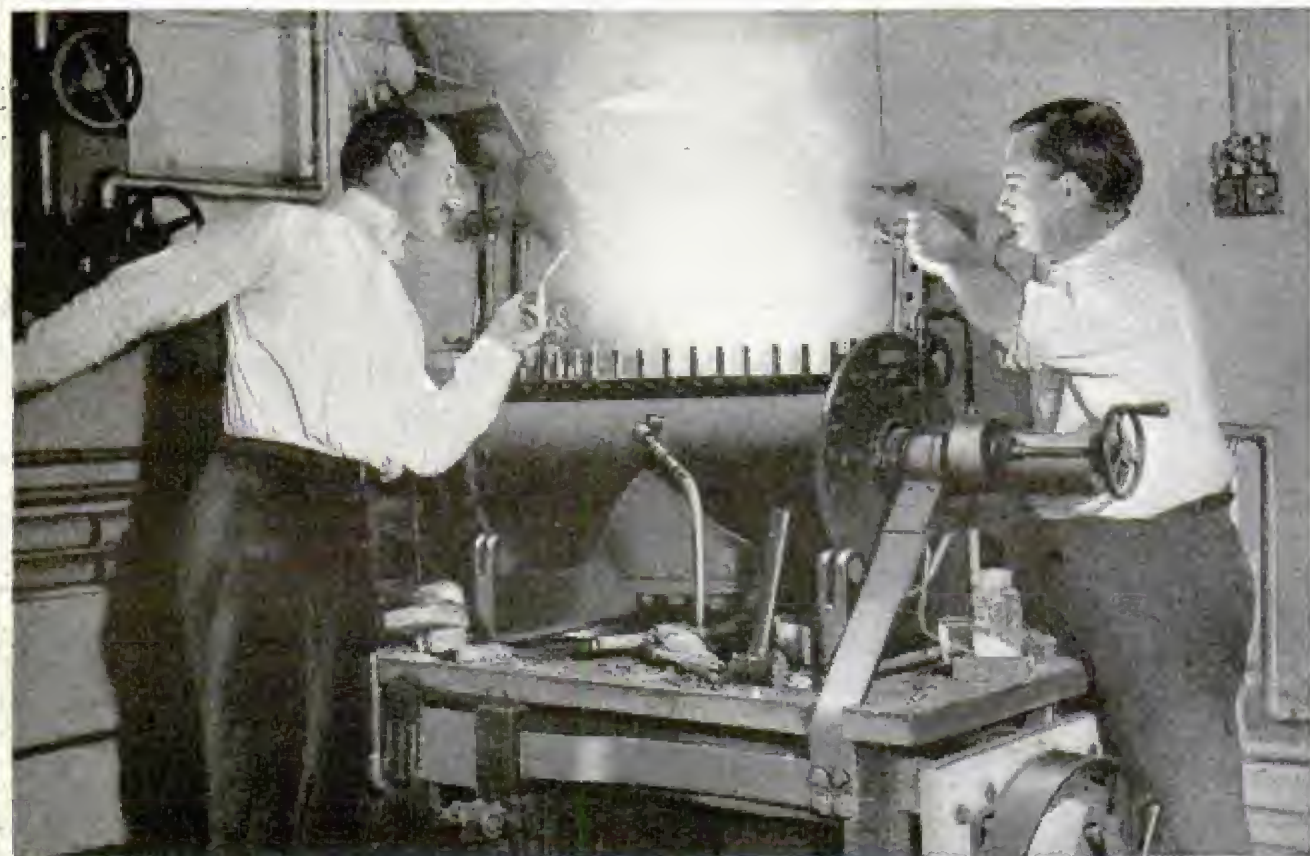
Through the steady progress of science, nature's secrets are being bared one by one, and now her most sacredly guarded secret—the secret of how earth was made, what its rocks and minerals are composed of—is not only being solved, but actual rocks and minerals are being reproduced by artificial means,—reproduced in a much purer form than they were originally made by nature.

The place at which these wonderful experiments are being conducted is the Carnegie Geophysical Laboratory, a part of the Carnegie Institute of Washington, D. C.

Nature has not given up her secrets willingly. They have been wrenched from her by hard work and the expenditure of large sums of money. The geophysical laboratory represents an outlay of more than \$300,000, and what will be spent in the future for conducting these experiments is not known. While the brain of man of course is the dominating factor in this work,

that brain is helped out by intricate and costly machinery. Think of a furnace where a heat of 5,000 deg. F. may be obtained and a machine capable of exerting a pressure of 200,000 lb. to a square inch. And then think, if you can, of combining these two forces. If any substance has a secret it certainly must divulge it when subjected to that heat and pressure.

This laboratory is a building within a building. Outside the exterior brick wall is an insulating layer composed of 6 in. of hollow terra cotta, with air spaces laid horizontally and closed at the ends. This insulation, which will keep the heat out in the summer and the warmth in during the winter, is almost as strong, structurally, as the brick wall underneath. The delicate measuring and observing instruments in the laboratories on the upper floors are protected by a novel arrangement from the jar of the heavy machinery in the basement. Each basement room containing heavy equipment has for a



Watching Flames in the High-Temperature Furnace through a Ruby Glass

floor a thick slab of cement separated, bottom and sides, from the adjoining walls by a 6-in. layer of dry sand. These same delicate instruments are protected from dust by filtered air.

Rock formation, like other physical and chemical phenomena, is the result of certain forces acting upon forms of matter. An exact knowledge of rock formation, accordingly, will depend upon the ability to establish definitely the characteristic properties of these particular forms of matter and to measure the forces which act upon them in each case. The facts that the original rock-forming minerals do not occur in nature in great purity, and that the active forces are applied over a great range of conditions and—in nature—over long periods of time, merely encumber the problem with technical difficulties of considerable magnitude; they do not confuse its analysis.

The efforts of the geophysical laboratory so far aim to extend the methods of accurate temperature measurement to include the entire field of rock formation. This work, covering the establishment of a fundamental tem-

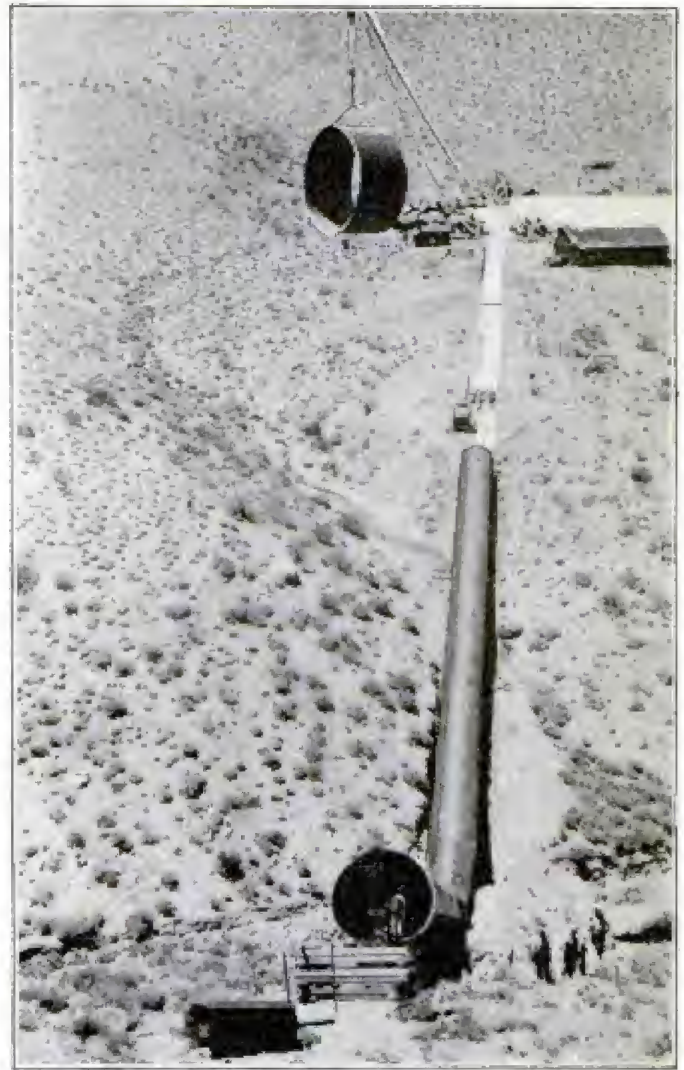
perature scale and several modes of applying it to the minerals, is now practically completed for the temperature range from 0 to 1,550 deg. C. (32 to 2,822 deg. F.), where all known rocks are molten.

After devising means to determine the temperature at which minerals form, thus providing a temperature scale in terms of which the history of the cooling earth can be expressed, it becomes necessary to measure the amount of energy involved in certain phases of the formation process. Here, again, the methods of physics are complicated in technical character and seriously limited in scope and accuracy. Hardly an attempt has been made to determine the quantity of heat involved in chemical reactions at temperatures as high as those at which minerals form. Of the results obtained at the laboratory, it may be said that specific heats can now be measured in any portion of the temperature range stated above with an accuracy ten times greater than that usually found in similar measurements at ordinary temperatures.

INVERTED SIPHONS OF LOS ANGELES AQUEDUCT

In constructing the new waterworks system of Los Angeles, California, by which the waters of the Sierra Nevada are to be carried 250 miles southward through the longest aqueduct in the world, some method had to be devised for crossing deep cañons and gulches. The Romans overcame these natural obstacles by tier on tier of concrete arches raised to the elevation at which the water was to be carried across, but modern engineering employs steel, and in a number of instances the water will be carried across chasms by means of inverted steel siphons, the outlets of which are slightly lower than the inlets, so that the water will traverse the distance by means of gravity.

The siphons of the aqueduct will be more than 20 in number, will have an aggregate length of 12 miles, and a diameter of from $9\frac{1}{2}$ to 11 ft. The first siphon to be completed is 1,409 ft. long, across Nine Mile Cañon, on the edge of the Mojave desert. The lowest point is 180 ft. below the intake, and here the steel plates are designed for a working pressure of 15,000 lb. per square inch. The sections of pipe were too large to be transported economically, so each section, after being set up in the east and given its proper number in the completed siphon, was taken apart. In this way it was possible to nest three or four sections into a comparatively



Lowering Sections of Nine Mile Cañon Siphon into Place

small space for transportation. The location of the siphon is some miles from a railroad, and the steel sections had to be hauled to the bottom of the cañon by caterpillar tractors or 6-mule teams.

TO GASOLINE

YOU may sing of the virtues of horses,
And prate of the profit of steam,
Of the power of roaring Niagaras,
Or argue on similar theme.
But the thing that I value most highly,
Of all of such wonders I've seen,
Is neither the horse nor the water nor steam,
But the thing called gasoline.

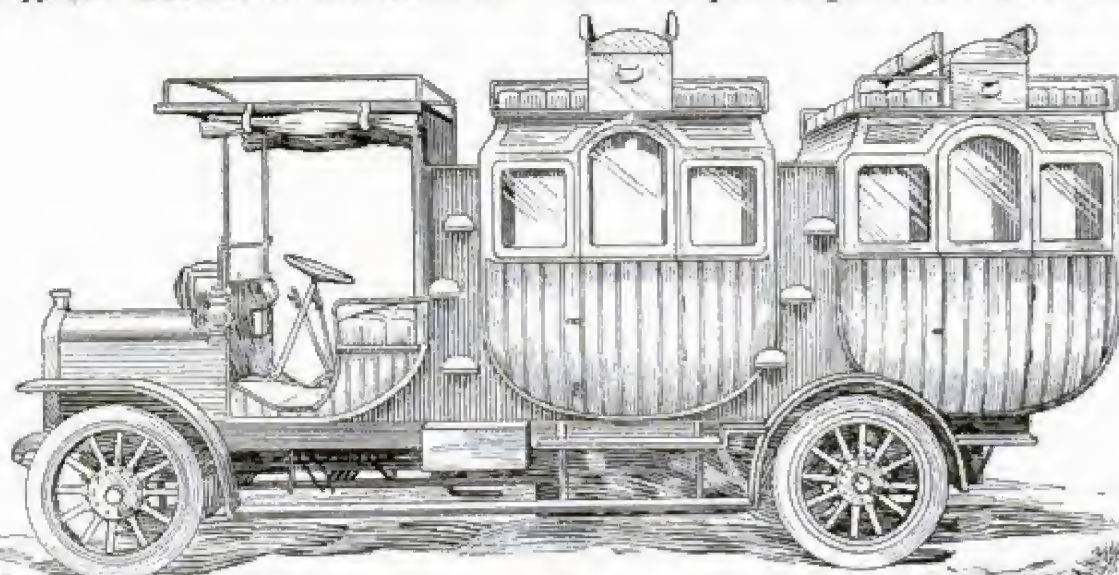
She comes from the rock's deepest layers—
A remnant of life far away—
The spirit of life prehistoric,
Assisting us mortals today.
So I'll sing to our vaporous helper,
Whose qualities potent and rare
Have made her the queen over water
and land,
And empress of roads and air.

CHARLES REED SANDERSON

MOTOR-COACHING IN ENGLAND

Although coaching through England is now practically an enjoyment of the past, due to the advent of the automo-

structed. These coaches, of which the one shown in the illustration is a fine example, have the passenger-carrying portion patterned after the old-time coaches. This coach will accommodate 30 passengers, inside and on top;



Courtesy Motor, London

An English Motor-Coach Which will Accommodate 30 Passengers

bile, there are still a few horse-drawn coaches of the old type in service, and several motor-coaches have been con-

and was recently used for carrying sightseers to the aviation meet at Brooklands.

NEWSPAPER ONE THOUSAND YEARS OLD



The Tching-Pao, which is the official gazette of Peking, has just celebrated its thousandth anniversary and claims to be the oldest newspaper in the world. Ever since its inception a copy of each issue has been carefully preserved in the archives of the Peking palace. Accuracy has always been the keynote of this paper, and, in order to maintain its high standard, several journalists on its staff in the past paid the penalty of mistakes with their lives. Dismissal and, at the worst, imprisonment, is the punishment meted out at present.

One of the most important features of the new automobile code recently adopted in France is the elimination of a speed limit, the law demanding only of the motorist that he "shall always be master of his speed" and that "his speed shall never be so fast as to damage the road or its works."

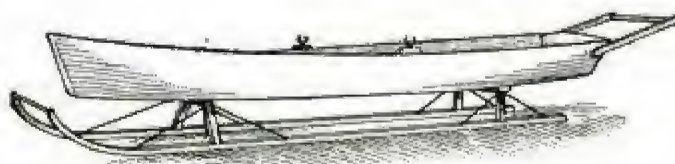
The Oldest Newspaper in the World Celebrates Its 1,000th Anniversary



Combination Fishing Sleigh and Boat

During the winter there is a great deal of fishing done through the ice on Lake Erie. In the neighborhood of Buffalo the strong current of the Niagara River causes treacherous breaks to occur in the ice, often marooning parties of fishermen with their dog sleds five or ten miles from shore on ice floes.

During the past winter a few sleds were made up as shown in the sketch with a small flat-bottom boat, instead of the ordinary box, mounted on top. With this arrangement the fisherman, when he comes to a break in the ice,



Boat on Runners

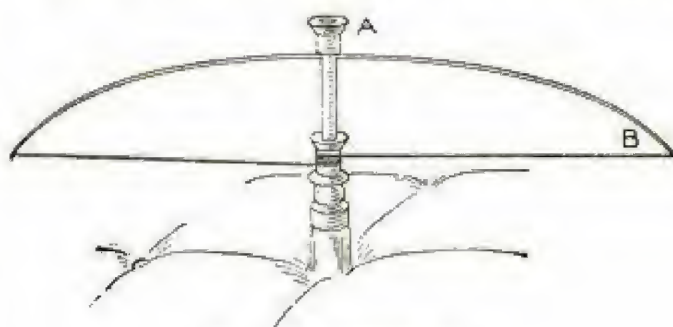
takes his dog team aboard and launches his sleigh-boat and rows to the next ice floe.—Contributed by James O'Brien, Buffalo, N. Y.

Cleaning Tufts in Upholstered Furniture

A handy device to clean the dust out of the tufts in upholstered furniture can be made as shown in the illustration. Procure an ordinary round paintbrush and attach a half of a common spool so it will turn loosely on a screw turned into the end of the handle. Near the brush, on the handle, fasten a whole spool with brads. Make a bow of an old umbrella rib and a stout cord. Before fastening the cord it is

given a couple of turns around the spool.

Hold the half spool, A, in one hand,

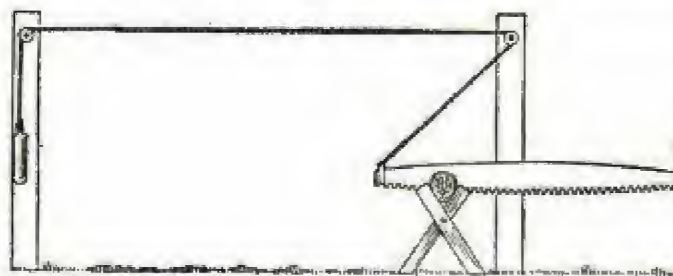


Brush on Spindle End

and the end of the bow, B, in the other, and push it back and forth. This causes the brush to revolve very rapidly, loosening the dirt and throwing it out.—Contributed by Joseph L. Schreick, Portsmouth, O.

One-Man Crosscut Saw

The illustration shows how I rigged up a large crosscut saw to cut large logs without the aid of another person. The opposite end of the saw is kept from digging too deeply into the wood by a rope run over two pulleys on posts and a weight tied to its end. The weight should be in proportion

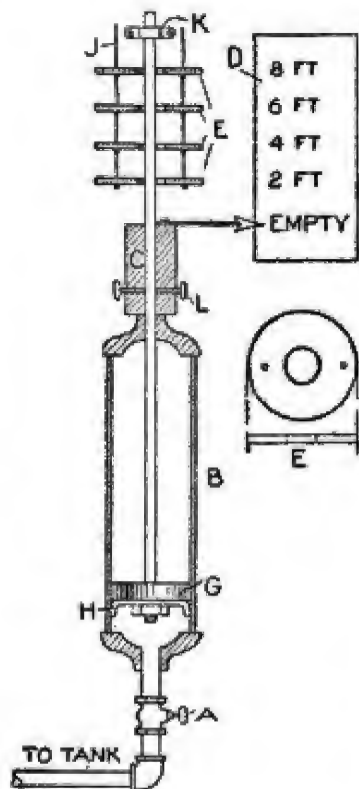


Balance for Saw End

to the weight of the saw end.—Contributed by Fremont Leland, Chester, Connecticut.

Water-Level Indicator for a Tank

A pressure gauge is sometimes used to take the place of a water-level indicator on a tank. This method is not always reliable, as on high-pressure gauges the movement of the indi-



cator hand is so slight, even for a difference of 2 ft. in the depth of the water, that it is hardly noticeable. The level indicator shown in the sketch is a homemade affair which can be placed in a pump room. The indicator has a length enough to register any depth of water, and the size of the cylinder makes it less liable to

stoppage from sediment.

The cylinder B is of cast iron, which can be bought cheaply. A pump cylinder with the guide rod will answer the purpose nicely. The pipe at the bottom is connected to the delivery pipe from the bottom of the tank or to the pipe from the pumps that enters the bottom of the tank. It is optional with the builder to use the globe valve A. The piston consists of a cup leather, H, and an iron washer, G. The piston rod has a guide, K, at the top and a lead weight, C, which is just heavy enough to balance the weight of the water from the bottom of the tank. The weight is held in place with the thumbscrews L. Small lead or iron weights, E, are hung on the cords J. The heft of these weights must be determined by testing. As the water rises in the tank, the weight C rises with the piston until the first weight E is reached when it comes to a stop until the

water is raised high enough in the tank to raise the extra weight, and so on for each succeeding weight. The indicator board and pointer are shown at D.—Contributed by Jas. E. Noble, Toronto, Ont.

Emergency Bolts

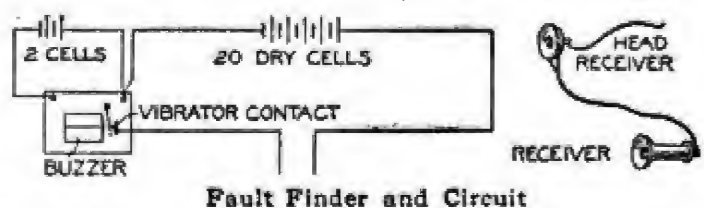
It is impossible to carry with any traveling machine, such as an automobile or any commercial machine, a sufficient number of bolts of the right length to replace any bolt that may be broken or lost. In making a temporary repair of this nature I found it quite handy to thread a piece of rod having a diameter that will answer the purpose for the majority of the bolts in the machine, for its entire length, say, 10 in. or any convenient length.

When any bolt is lost, a new one that will serve temporarily may be made by cutting off a suitable length of rod and placing a nut on each end. Almost any bolt may be replaced in this way, in fact the rod may be bent to make a U-bolt if desired.—Contributed by Thos. L. Parker, Wibaux, Montana.

Homemade Fault Finder

The sketch illustrates a homemade fault finder which will readily locate grounds, crosses and shorts in an aerial cable. I have used such an apparatus for several years and have yet to see it fail to do its work.

In using this apparatus, connect the two leads to each side of the pair of crossed or short-circuited lines. If

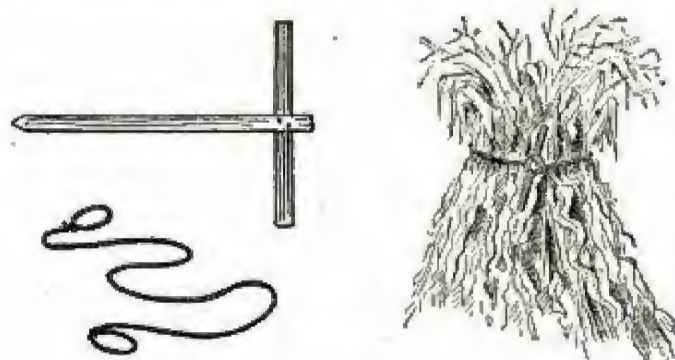


lines are grounded, connect the wires to one lead while the other lead is connected to the sheath. The helper now puts on the head receiver and rides out

on the cable in a "buggy," holding the large bipolar receiver against the cable sheath until he loses the "buzz." The buzz stops as soon as the receiver passes the trouble. The cable should be cut where the buzz is lost and the trouble cleared. The large receiver should have the cap and diaphragm removed.—Contributed by G. M. Peterson, Buffalo.

Tying Fodder

A very useful device as an aid in tying fodder can be made of two pieces of wood, one about 2 ft. long and the other about 18 in. long, formed into a cross and firmly fastened together, and a piece of rope 9 ft. long with an eye



Aid in Fodder Tying

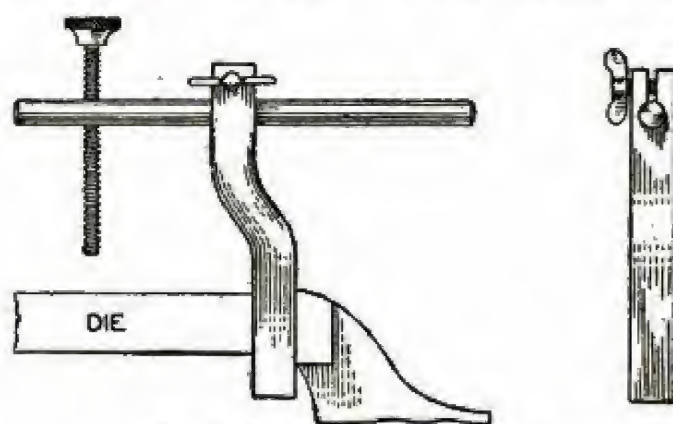
in each end. The long piece of the cross is stuck into the fodder shock and one loop of the rope placed over one end of the cross. The other end of the rope is passed around the shock and the loop placed over the other end of the cross. A few turns of the cross will draw the fodder together for tying.—Contributed by R. H. Workman, Loudonville, Ohio.

A Die Clamp

The accompanying sketch shows a simple die clamp I made and am using to good advantage. A piece of $\frac{1}{2}$ -in. square steel was cut $4\frac{1}{2}$ in. long and bent to shape as shown and a $\frac{5}{16}$ -in. hole was drilled and reamed so that a $5\frac{1}{2}$ -in. length of drill rod would have a sliding fit.

The top of the square piece is split to clamp the drill rod and a small

thumb screw fitted on one side. The ends of the rod are rounded off neatly. A hole is drilled and tapped $\frac{3}{4}$ in. from one end. A 4-in. screw having a

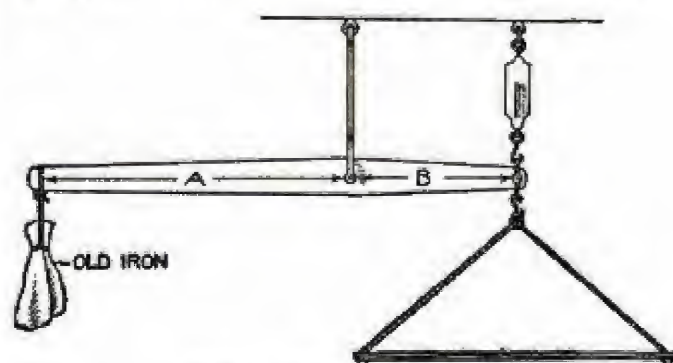


Clamp for Holding Die Pattern

knurled head and threaded the entire length is turned into the threaded hole. The rod can be extended as far as any ordinary vise will open. This is a very handy tool for holding down work on a plate to be marked out for a die.—Contributed by J. A. Kottmann, Ansonia, Conn.

Beam Attachment for Spring Scales

Spring scales weighing articles up to 50 lb. can be used with a beam attachment for weighing any number of pounds within a reasonable limit. The beam is attached to an overhead support with a screweye, the pivot being in such a place as to make the length A twice the length B. Bags of old iron weighing 25 lb. each are used on the end of the beam. If an article weighs 110 lb., it will require four

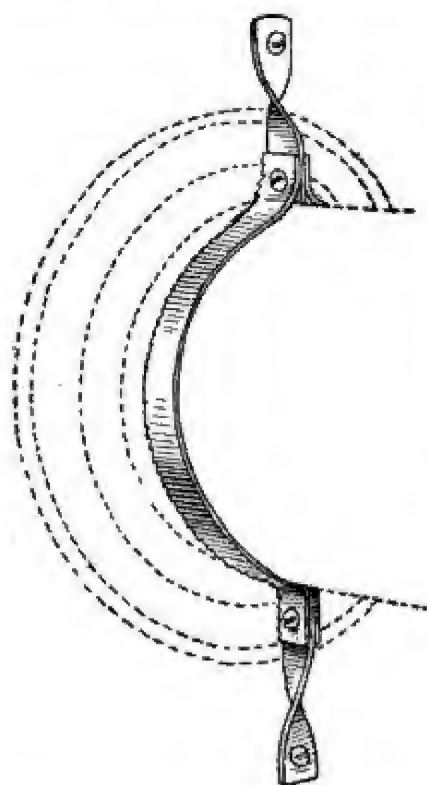


Beam Attached to Scales

weighted bags and the 10 lb. will be registered on the dial of the spring scale.—Contributed by Joe V. Romig, Allentown, Pa.

Securing a Stovepipe in a Flue Opening

A simple method of preventing stovepipes from sliding too far in flue openings is shown herewith.



Take two hacksaw blades and cut them off to such a length that they will overlap an inch or so at the end when bent over on opposite sides of the pipe. Two flat strips of iron, about 4 in. long and twisted through a right angle, two short stove bolts

for securing the saw blades to the strips through holes drilled or punched in their ends, and two screws for fastening the free ends of the strips to the walls are also required, the method of installation being clearly indicated in the sketch. By screwing up the stove bolts, the saw blades will tightly grip the pipe, the natural spring of the blades serving always to give a good grip which will never permit the device to work loose as long as the bolts hold.

This makeshift device is far more sightly and serviceable than ceiling wires and if carefully made will last a lifetime.—Contributed by Victor Labadie, Dallas, Texas.

Black Acid-Proof Stain

A stain made up by the following formula has been in use for some time in our laboratory for staining the tops of tables. It produces a soft black color which no reagents affect. Neither lye nor acids discolor it. Tables treated with this stain should be wiped

off about every two months with a cloth moistened in boiled linseed oil.

Take $1\frac{1}{4}$ lb. of copper sulphate (blue vitriol) and $1\frac{1}{4}$ lb. of potassium chlorate, and add sufficient water to make 1 gal. of solution. Boil and stir to dissolve completely and label No. 1. Mix 1 pt. of muriatic acid in 1 pt. of aniline oil. Add the acid to the oil slowly and in small quantities. Add sufficient water to make 1 gal. of solution and label it No. 2.

Apply a coat of No. 1 and allow it to dry, then put on a coat of No. 2 and let that dry. Wash well with soap and water and allow to dry. Then apply another coat each of No. 1 and 2, allowing time for each coat to dry. Wash again, dry and apply another coat of No. 2 and let it dry. Wash and rinse the surface well and let it thoroughly dry and apply two coats of boiled linseed oil.—Contributed by A. W. B., Rockville, Ind.

A Paint-Pot Bail

A convenient bail for attaching to a paint can having a ridge around the inside top for the airtight cover to fit into may be made in the following manner:

Procure a piece of No. 8 steel wire, 16 in. long, and bend it at both ends as shown in Fig. 1. The part A is to prevent the bail from falling down into the paint when the can is set down.

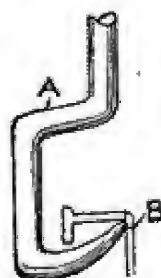
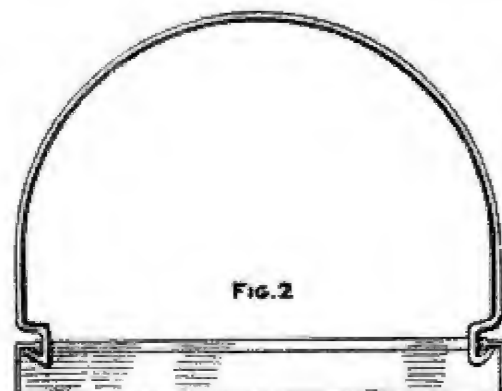


FIG. 1



Bail in Top of Pot

The only point of contact, B, should be filed down from the under side as shown. Bend the wire into the shape of a bail as shown in Fig. 2 and leave

the two ends far enough apart so that they must be sprung together slightly when putting the bail in place. When not in use the bail is easily removed and the airtight lid replaced.—Contributed by J. R. Montague, Niagara Falls, Ont.

Preventing Anchor Chains from Breaking

Chains which are subject to shocks, especially those used for anchor chains and hawsers, break, not from the steady strain which is applied to them, but from the sudden shock. To overcome this trouble, insert a spring where most convenient by hooking the ends of the same into the links of the chain as shown in the sketch. This leaves the spring independent of the holding of the chain. The material, resistance



Spring in the Chain

and length of the spring, also the number of links to skip are determined according to the nature of the work and size of the chain.—Contributed by H. A. Hobelman, Baltimore, Md.

Keeping Kettle Handles from Heat

Two methods to prevent a kettle handle from touching the side of a hot vessel are shown in the sketch. One method is to bend an elbow or shoulder in the piece of metal or ears holding the bail, as shown in Fig. 1. If the bend is made at the proper place, the wire will rest upon it, and the handle in the center of the bail cannot touch the sides of the hot kettle. This method may make it necessary to remove the bail and slightly bend it so that it will extend over the slightly increased distance between the ears.

The second method is to drill two holes in each ear, Fig. 2, and place small pins or stove bolts in them. The

bail will rest upon these pins and prevent the handle from touching the hot sides of the kettle.

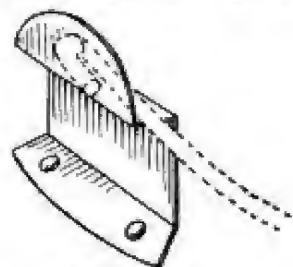


FIG. 1

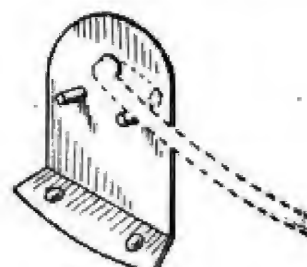


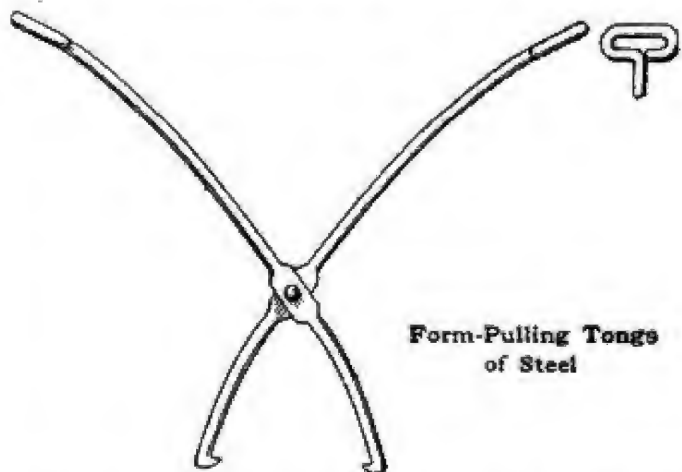
FIG. 2

Projections for Holding Bail

A simple plan of warming plates and dishes and to keep the food in them hot is to place the pins in such a position that the bail, in resting upon them, will be on a level with the top of the kettle. A plate or dish set on top of the kettle is partly supported by the wood handle, and the steam from the boiling water will keep the plate hot, it being necessary, of course, to remove the kettle cover when thus used.

Tongs for Pulling Concrete Forms

Quite often when pulling out forms used in making "goose-neck" curbs, the edges of the concrete are broken off by the crowbar in lifting them. The tongs shown in the illustration will avoid this trouble and will make the task much easier. The tongs are constructed of two pieces of $\frac{1}{2}$ -in. steel, each about 14 or 15 in. long. The tongs are made on the same principle as ice tongs, but of a different shape. Two pairs of these tongs are

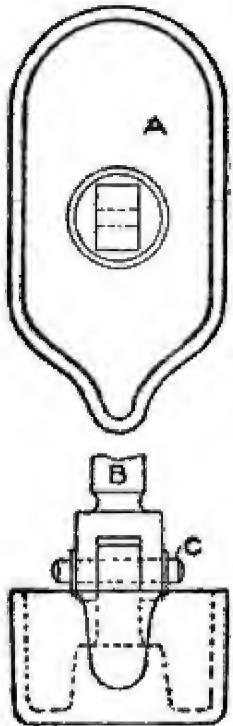


Form-Pulling Tongs of Steel

necessary when the long rear or front boards are pulled out.—Contributed by Gilbert A. Wehr, Baltimore, Md.

A Drip Cup

Drip cups are usually fastened to the hanger with a screw, which in time loosens by the vibration and drops with its contents to the floor. They are seldom replaced and the bearing keeps on dropping the oil on the floor or machine beneath. I have designed a drip cup that will stay in place indefinitely. The best feature of this cup is that its contents can be easily emptied by



Details of a Drip Cup

simply tipping the part A. The construction of the cup is very simple and inexpensive. The cup part has a round hub in the center with a rectangular projection as shown. This projection is drilled for the pin C. The cup should swing easily on the pin so that it may be tipped.

The fork-shaped part, B, can be made on the hanger casting, or, if the hanger is already in place or on hand, it can be made to screw in and pinned.

When the oiler oils the bearings, it is only necessary for him to tip the cup to take out the contents.—Contributed by Harold E. Murphy, Pawtucket, R. I.

Polished Floors

After much experimenting with wood fillers and finishes of various kinds and degrees of excellence, we have decided that plain boiled linseed oil, applied hot, makes the most desirable floor finish. To secure the best results, the oil should be put on the floor at the time it is nailed down. Lay a few boards, beat them together as firmly

as possible, and nail them securely. Cover this strip with hot oil, then lay another strip and oil it, and continue until the space is filled.

If this procedure is not practicable protect the floor from stains by a layer of sawdust, or old newspapers weighted down, and oil it as soon as it is finished. If the floor is soiled, it will have to be scrubbed before oiling, and this is not desirable, as it tends to increase shrinking. If oiled at once, the pores of the wood are filled and the floor will never show the unsightly gaps and cracks that come so soon, even in well laid floors. In six months' time, it may be well to go over the floor again. After this application, a coat once a year will be sufficient.

Nothing but oil should be put on an oak floor. Oak is a very porous wood and needs to be well filled. With time and use and an occasional rubbing with warm oil it will take on a high polish which is more beautiful and far more durable than any varnish. We have used the oil on hard pine also with excellent results. Varnish gives a quicker finish and at first looks well, but unless the boards have been filled with oil and used for a time before varnishing, they will warp and draw apart, and in a year or two you will need a new floor. Varnish can be used after the oil is thoroughly dried in but it is best to leave the floor without varnish.

Wax is less objectionable. It may be used after the wood is well filled and the surface absolutely dry. It gives a fine polish, does not warp the boards and makes a beautiful floor, but it requires too much care for a room constantly used. The oiled floor acquires its polish more slowly, and through usage. With a little care it is durable. The floor is easily cleaned and not easily injured. Grease does not hurt it. The dust may be wiped off once a week with a soft mop and clear water. Do not use soap—scrubbing is never necessary.

Heavy brushes are best for sweeping such floors, but a piece of outing flannel tied over an ordinary broom

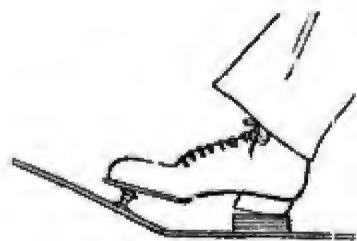
makes a very good substitute.—Contributed by Mrs. Helena Korte, Jamul, California.

Repairing Tin Gutters

An easy way to repair a leaky bucket or a tin gutter so it will last a year or more is as follows: Paint the metal inside and out, then paint one side of a strip of cloth and apply it to the inside painted surface of the metal. Paint over the cloth and metal, and you will have a first-class repair.—Contributed by Maurice Baudier, New Orleans, La.

Heel Support for Automobile Drivers

When driving my car with the accelerator pedal, I found it very hard on my ankle and leg to hold the foot in the abnormal position required,



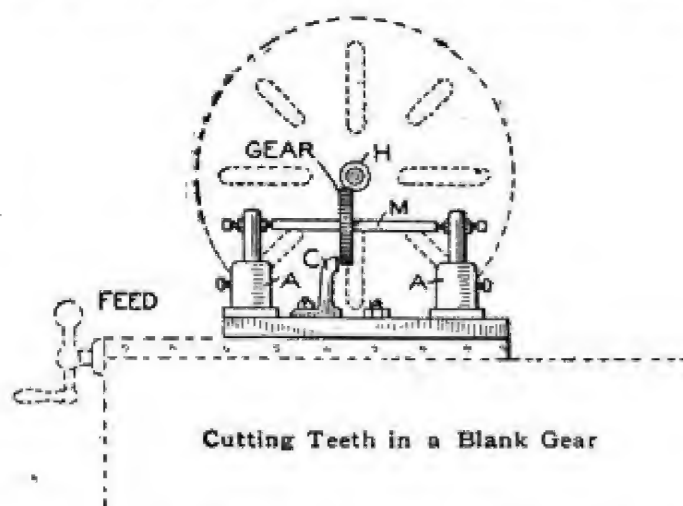
says a correspondent of Cycle and Automobile Trade Journal. I nailed a block of wood, 3 by 3½ by 3½ in., to

the floor board in such a position that with my heel upon it the accelerator pedal was under my toe, with my foot in a comfortable, nearly horizontal position. I covered the top of the block with rubber matting to prevent my heel slipping off and painted the wood black. This is a great comfort and aid to me in driving. I can slide my foot forward until my toe touches the toeboard, supporting my foot, while I can push the accelerator pedal by simply bending my foot.

Cutting Small Gears in a Lathe

The workman in a small repair shop not equipped with gear-cutting or milling machines can cut small gears on a lathe, if it is fitted with a jig as shown in the sketch. The jig consists of a flat bed, which is bolted on top of the cross feed, fitted with two posts, A A,

that telescope so as to admit blanks of different diameters. A setscrew with



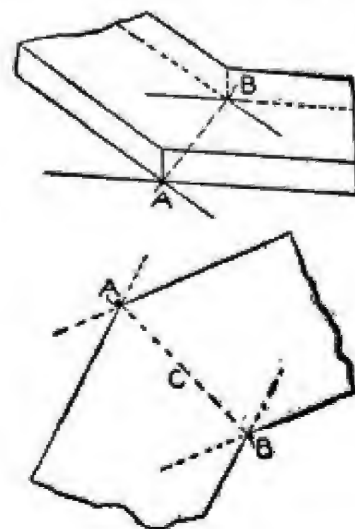
Cutting Teeth in a Blank Gear

a locknut is provided for the top of each post as centers.

The blank gear is turned up to the proper size to cut the right number of teeth and placed on a mandrel, M, and set between the setscrew centers. The posts can be adjusted to make the hob H cut the right depth. The brace C is to support the gear while it is being cut. The blank is fed on the hole by the cross feed.—Contributed by W. R. Ayers, Pittsburg, Pa.

Cutting Miters

The diagrammatical sketch shows how I cut molding to fit any angle without a miter box. Place a piece of the molding along one surface of the object where it is to be fastened and scribe the outer surface against the ceiling or floor, as the case may be; then place the molding along the other side and scribe a line. While in that position scribe the inner surface of the molding with a sharp knife at the point marked B, also at A, the intersection of the lines scribed on the

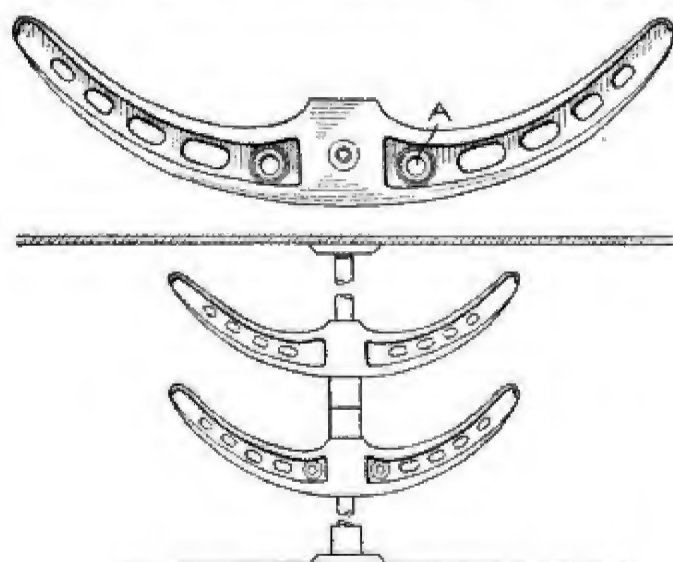


outer surface of the molding. Connect the two knife marks as shown by the dotted line C, and saw outside of the line about $\frac{1}{8}$ in. Cut all the molding before nailing.

In case of a crown molding on a wardrobe, put a temporary top on, letting it project far enough to get the necessary marks, then remove and nail the molding in place. This method will work on any angle.—Contributed by W. E. Gore, San Francisco, Cal.

Pipe and Rod Storage Rack

The illustration shows the general arrangement of a rack for the storage of rod stock and pipe. Extra heavy



Castings for the Storage Rack

steel pipe is used for the uprights which are fastened to the floor and ceiling with 6-in. round floor flanges. Three cast-iron separating collars are placed at the base to raise the lowest rack section some distance from the floor, then alternately one of the rack sections and one of the separating collars.

The rack sections are held from turning by a $\frac{5}{8}$ -in. setscrew which is screwed into the tapped hole in the hub and also by placing sections of 1-in. pipe between the racks. A piece of $\frac{5}{8}$ -in. round steel is run through these sections of pipe and also through the holes A in the racks. These rods are threaded on both ends for nuts which hold them in place.—Contributed by D. A. C., Harrisburg, Pa.

Depth Cutting in a Lathe

There are numerous ways better than using a depth gauge in cutting to a certain depth on a lathe. The gauge method of finding the proper depth requires cutting and trying several times before the result is obtained. Sometimes the compound rest is set at an angle of 30 deg. for thread cutting, and is left in that position, unless some other angle is required. Where the compound rest is graduated on the lathe, the depth can be obtained by simply multiplying the required depth by 2. The sine of 30 deg. being 0.5, the compound rest would have to move 1 in. in order to make the tool move in $\frac{1}{2}$ in. Take for a more comprehensive illustration an equilateral triangle, the sides of which are 1 in. long, the angles being 60 deg. One-half of this would be 30 deg., hypotenuse 1 in. and the opposite side $\frac{1}{2}$ in. The hypotenuse represents the center line of the compound rest.

Another method is to set the compound rest at zero (any angle) and run the carriage up until the tool just touches the work, lock the carriage and run the compound rest out, until you can "feel" with a piece of cold-rolled steel of the required size. Then unlock the carriage and run it up until it touches and lock again. Feed the compound rest in to the zero point and note the revolutions.

Still another method is to clamp a piece of stock with the square end on the lathe, where it will come against a clean, smooth surface of the carriage, put a piece the right size between them, lock the carriage and feed the compound rest up until it touches. Take out the piece and run the carriage to the stop.

These methods have been used with success and have been found very handy and simple.—Contributed by John Homewood, Chicago.

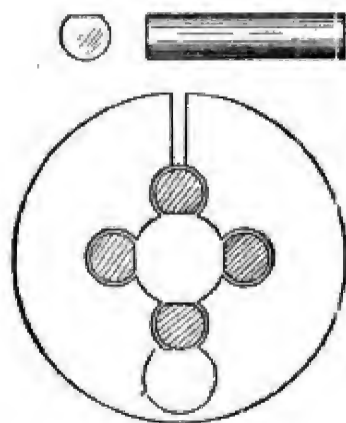
Ⓐ sash lock can be used the same as a bolt on a door, if the casing is flush with the surface of the door.

Waterproofing Blueprints

Blueprints to be carried into wet mines or tunnels may be made waterproof by the following process, according to the Mining and Scientific Press: Immerse a number of pieces of absorbent cloth, 1 ft. or more square, into melted paraffin until saturated. When removed and cooled they are ready for use at any time. Spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flatiron. The paper immediately absorbs paraffin until saturated and becomes completely waterproof.

Retapping a Die

When a die becomes worn so as to cut a ragged thread, anneal it, close the die down and fill the open spaces with plugs as shown. Each plug should have a flat surface toward the center of the die. Tap out the threads the same as tapping a hole, remove the plugs and temper.—Contributed by J. F. Tholl, Ypsilanti, Mich.

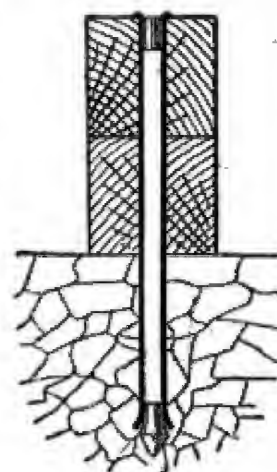


Fireproof Paste for Furnaces

A paste or mortar that will close up cracks in furnaces to keep the gas from escaping can be made as follows: Mix together 75 parts of wet fireclay, 3 parts of black oxide manganese, 3 parts of white sand, and 1 part of powdered asbestos. Thoroughly mix by adding enough water to make a smooth paste. Apply this paste over the cracks and when dry it will be as hard as iron and stick like glue.—Contributed by H. D. Chapman, Washington, D. C.

Anchoring Beams to Rocks

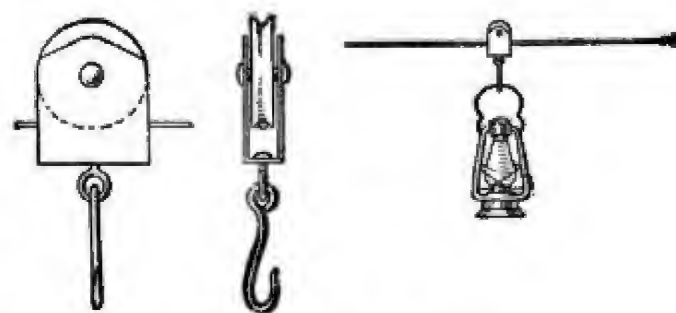
Beams or timbers may be solidly fastened to a rock or concrete foundation with a piece of pipe as shown in the sketch. A hole is drilled into the foundation the same diameter as the pipe. A taper plug is cut from a piece of hard wood having its largest diameter just equal to the hole drilled in the rock. The pipe is driven through the hole in the beams and into the rock.



When the end of the pipe strikes the taper plug, it is spread out against the sides of the hole. If the pipe is expanded at the top, the beams are more firmly held to the rock.

Lantern Hanger for a Barn

The hanger shown in the sketch makes a safe and handy way to use a lantern in a barn or stable. It is constructed of an old grooved pulley with a U-shaped hanger made of sheet iron. The hook hanger is made of a screweye cut off and riveted in place, the hook being formed of heavy wire. The pulley is run on a wire stretched overhead from one end of the barn to the

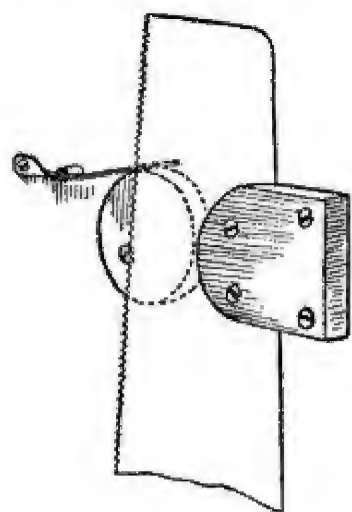


Trolley Lantern Hanger

other. The lantern can be easily moved from place to place, and, as it is up out of the way, it cannot be turned over.—Contributed by I. B. Spittel, Baltimore, Md.

Holder for a Handsaw

The workbench should be provided with a place for each tool where they will be handy for the workman. The



saws are usually hung on a nail driven into the wall over the bench. When hanging a saw on a nail it must be held by the blade, which necessitates both hands in turning the saw. I use a holder such as is

shown in the sketch.

The holder consists of two blocks of wood, one $2\frac{1}{4}$ in. long and 2 in. wide, having one end cut on an arc of a circle, the other being a circular disk 2 in. in diameter. The former block is fastened with screws to the wall and the latter is attached off center so its edge will turn close on the rounded edge of the stationary block. A spring is applied to the disk to keep its edge in close contact with the edge of the other block. The downward pressure of the spring clamps the saw and holds it very firmly. A slight movement of the saw upward and outward releases it.—Contributed by Irl R. Hicks, Hallsville, Mo.

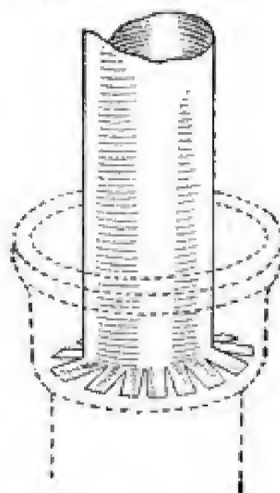
How to Clean Brass

Keeping the hundred and one brass articles, now so popular in the home, bright is a matter of a little effort at virtually no expense, says Beautiful Homes. If the teakettle becomes stained, dissolve some whiting in lemon juice and apply with a soft piece of flannel, after which give it a bath in soapy, hot water. When a tray becomes cloudy-looking, it may be restored by using salt and vinegar. Drop the salt upon the tray, moisten it with vinegar, and scour with paste thus

formed. Candlesticks discolored by gas from coal or wood may be brightened by rubbing them with a piece of soft leather. An old suede bag, a torn glove or a wornout leather pillow are just the articles to use. Soapsuds with a little ammonia is effective for embossed or pierced brass. It should be applied with a brush, and the article rinsed in warm water, then polished with a piece of leather.

Fastening Leader Pipes in Soil Pipes

When fastening leader pipes in soil pipes some of the cement is apt to drop into the soil pipe.

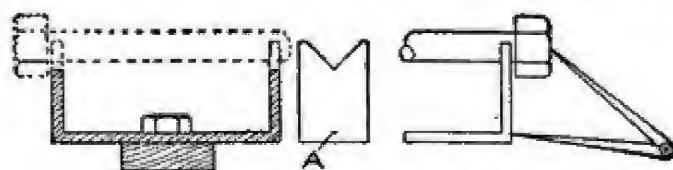


As I always had trouble with making a joint of this kind, I decided to use the following method, which has given good results: The end of the leader pipe is cut and the parts turned out, as shown in the sketch, so that they

will hold the cement in the joint.—Contributed by H. Van Vliet, Paterson, New Jersey.

Centering Bolt Heads

The average bolt made from rods does not have its body central with the head. The end of the bolt never is cut off squarely and it is hard to make center holes for the lathe. When the upper end is centered from the sides of the head the body is apt to run out of true. If there is not much stock on



Centering the Head of a Bolt

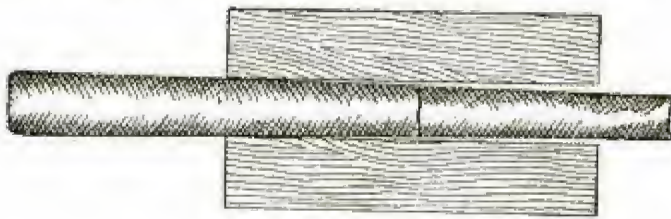
the bolt, it will require a bit of "center throwing" to get the bolt ready for centering.

The sketch shows a handy centering

arrangement made of sheet iron. The center-punch mark A is used for one leg of the dividers. The centers found by the dividers on this jig are the centers of the body of the bolt, and it requires but one drive of the center punch to fit it for the lathe. The tool can be attached to the wall or bench near a lathe.—Contributed by F. W. Bently, Jr., Huron, S. D.

Repairing a Whipstock

In a block of wood bore a hole the same size as the whipstock $1\frac{1}{2}$ in. below the break. If the whipstock is tapering, place the block over the break and pour melted babbitt metal into the space as shown in the sketch. If the whipstock is straight or does not taper very much, the hole must be bored $\frac{1}{8}$ in. larger than its diameter, but not en-



Whipstock in Mold

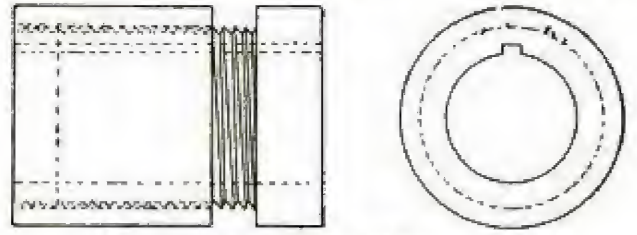
tirely through the block, the remaining distance being bored to fit tightly on the whipstock. The space is then filled with babbitt. When cool, the babbitt is finished with a sharp knife or file.—Contributed by S. V. Crane, Anderson, Cal.

An Adjustable Spacing Collar for Arbors

An old slab-milling machine used for cutting keyways in shafting had no side adjustment, and, as different-sized shafts were keyseated each day, the collars had to be changed each time. Adjustment was made easy by constructing adjustable collars as shown in the sketch.

One of the collars was placed on between the shoulder of the arbor and the first cutter, and the other between the cutters, says American Machinist. The collars were made of cold-rolled

steel, having a nice snug fit so that they could be screwed together or apart as the case might be, with the



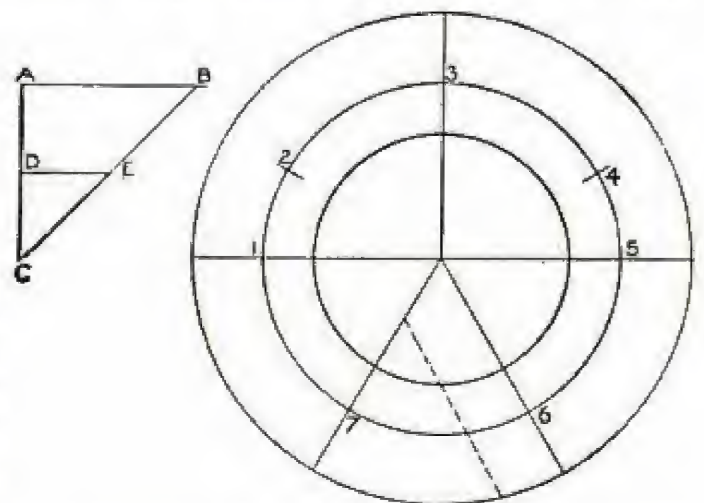
Adjustable Collar

fingers. The sleeve and the main body were knurled to simplify the movement. By loosening the nut on the end of the arbor it makes a very short job to arrange the cutters where they are wanted.

Rule for Smokestack Pitch Top

Draw the lines AB and AC with a square and mark the length of one-half the diameter of the top on the line AB. The height is marked on the line AC. Then one-half the diameter of the pipe is marked DE, parallel to AB. Set the compass from C to B and scribe the outside circle and set from C to E and scribe the inner circle. Set the divider points on A and B and step off six spaces on the outside circle.

Cut the gore out on the dotted line and line 7, extending latter to the center. Draw lines 1, 3 and 5. The inner

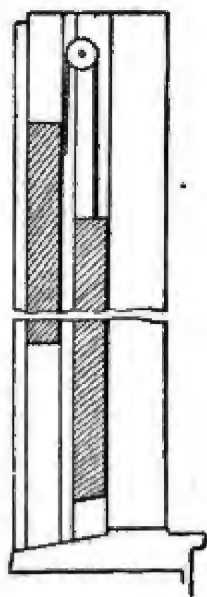


Layout for a Pitch Top

circle and lines 1, 3 and 5 show where to attach straps for holding it on the pipe.—Contributed by S. C. Shipman, Steubenville, O.

Ventilating at the Top and Bottom of Windows

The ventilation of rooms should be accomplished through window openings both at the top and bottom. If the window sashes are fastened as shown in the sketch, the opening can be made in one operation. The top of each sash is connected with a rope which runs over a pulley at the top of the window opening. When the lower sash is raised, the top sash will descend and make the openings both top and bottom equal.—



Contributed by Paul H. Burkhardt, Blue Island, Ill.

Bending Short Pieces of Pipe

It is very difficult to bend short pieces of threaded pipe without damage to the threads or kinking the pipe. The bend can be easily made in the following manner: Screw an ordinary coupling on each end of the pipe and heat it almost to a white heat. Then cool each end in water, place in a vise, and tighten the jaws just enough to hold it firmly.

Insert an iron bar into each end of the pipe and force the bars in an upward direction and the result will be a smooth bend. If the pipes are too short to be held in the vise without clamping the couplings, use two pieces of flat iron between the couplings.—Contributed by J. B. Shiver, Rock Hill, South Carolina.

Finding Polarity of Electric Wires

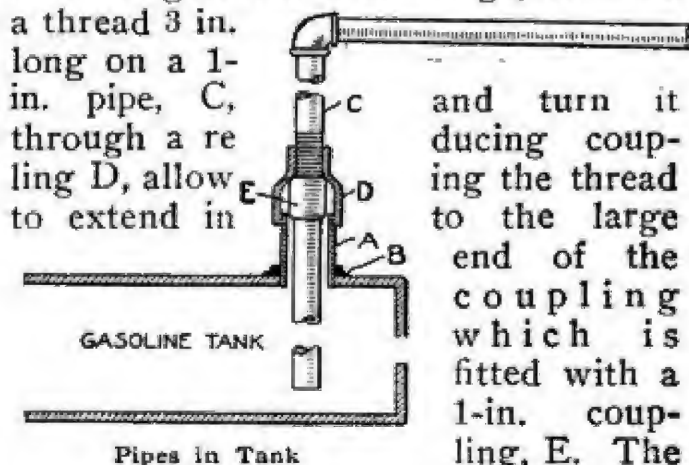
The polarity of wires can be found by placing the ends of the wires in a common white potato cut in halves. The wires should be stuck in a small space apart, the distance depending on the voltage. The positive wire of a direct current will turn the potato

green and the negative side will remain uncolored. Both ends of the wire on alternating current will turn the potato green.

This method can be used in finding the polarities of current from one dry cell up to 500 volts direct current, the only difference is that with very low voltages the wires should be stuck in the potato closer together than with higher voltage. In using 110 volts, the time necessary to determine the polarity is about 10 seconds, and with a current of, say, 2 volts and upward to 10 volts, it will require about 1 minute. If electrical workers will always carry a potato in their tool bag, they will always have a reliable polarity indicator.—Contributed by Geo. H. Davie, Erie, Pa.

Air-Tight Connection for Underground Tank

Screw a 2-in. nipple, 2 in. long, A, into the gasoline tank flange, B. Cut a thread 3 in. long on a 1-in. pipe, C, through a



and turn it reducing coupling the thread to the large end of the coupling which is fitted with a 1-in. coupling, E. The end of a 1-in. pipe is threaded and then cut long enough to allow a space of 1 in. at the bottom of the tank, when it is screwed into the coupling E. When the reducing coupling D is turned on the nipple A, all joints will be air-tight.—Contributed by Geo. M. Crawley, Jr., Newark, New Jersey.

¶The ordinary lamp wick is too loosely woven to give best service in incubator lamps. This can be remedied by sewing back and forth across the wick, about 6 or 8 rows of stitches to the inch.

Hose Connections

Wishing to use my garden hose which had a leak and not being able to get a regular coupling I made the repair without one. The job turned out as good as if the ordinary coupling were used.

I cut the hose as true as possible at the point of the leak and then inserted a $\frac{1}{2}$ -in. nipple, 3 in. long (Fig 1). I twisted one turn of bailing wire directly over the threads of the nipple



Fig. 1

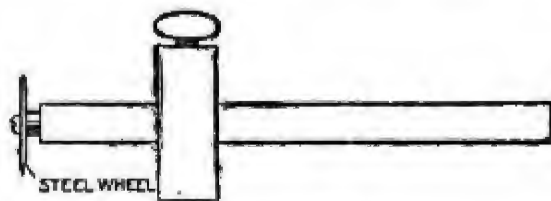
Fig. 2

Pipe Nipple Used for Connection

(Fig. 2) and twisted it up tightly with pliers. The result was exceedingly satisfactory under high water pressure. —Contributed by Frank E. Drumm, Johnstown, N. Y.

Rotary Marking Gauge

Every woodworker knows that the ordinary marking gauge with the pin arrangement has a tendency to follow the grain of the wood, causing the line to be drawn irregularly. This trouble may be overcome by placing a small steel wheel so that it will easily revolve on the end of the gauge as shown in the sketch. When marking a piece of irregular-grained wood, the steel wheel



Wheel on Gauge

will not dig into the grain, but will roll over it and make a straight mark.

Wood Turning with a Ripsaw

In a mill where I was working we had an order to make a number of rollers and not having a lathe in the mill, I turned the pieces on a ripsaw. Figure 1 shows the work in position on the table against the gauge, and

Fig. 2 the construction of the box with the stock held in place with two screws as centers. The stock was first cut to

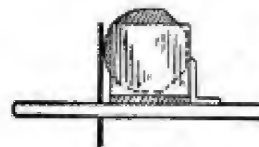


Fig. 1



Fig. 2

Material in the Box

an octagon shape, then successive slight turns were made to cut off all corners. The same method can be used on a bandsaw.—Contributed by F. O. Anderson, San Francisco.

Putting an Eye in a Wire Rope

A simple method of splicing an ordinary wire rope for an eye so it will be as strong as the rope, is as follows: Use a strong thimble for the eye. Turn the rope around the eye and carry it back about 6 ft. along the main part. Lash the two parts together by passing a wire over and under the rope, forming a turn similar to a figure 8; then put on several short lashes, B, by wrapping the wire tightly around the two parts of the rope. This method of splicing for an eye will hold heavy work without breaking the eye or slipping.



Laying a Plank Sidewalk

In laying boards or plank where they are exposed to the weather they will last much longer if laid with the heart side down. If the planks are placed as shown at A, they will retain the water and moisture much longer and cause



A



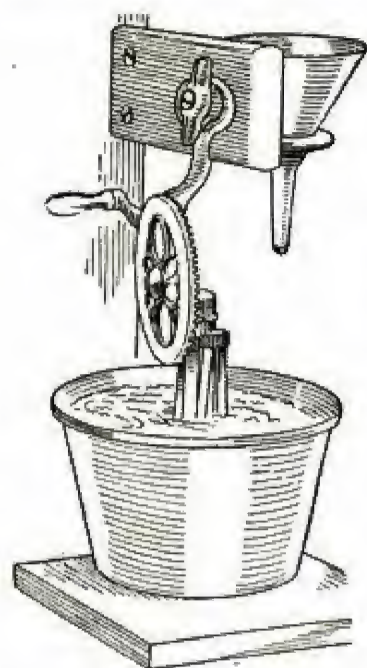
B

Showing Position of Grain

decay more rapidly than if placed as shown at B.—Contributed by Geo. M. Harrier, Lockport, N. Y.

Mayonnaise Mixer

The method of preparing mayonnaise and whipped cream, which have become necessities of the modern home,



has not kept pace with their increasing appreciation by the public. Their popularity would be greater if a handier method for the proper mixing were available. A good mixer can be purchased, but the price is out of reach of many. The one shown in the sketch is a

homemade affair the parts of which can be purchased very cheaply. The outfit consists of the following parts: A hardwood bracket, $\frac{3}{4}$ in. thick, $2\frac{1}{2}$ in. wide and 7 in. long, with a place chiseled out to receive the handle of an egg beater. The beater is made detachable by means of a $1\frac{1}{4}$ -in. cupboard button fastened to the bracket with a stove bolt. A ring such as used by harnessmakers is fastened to the opposite side of the bracket for holding the funnel.

The flow of the oil in making mayonnaise should be restricted by a cork with a small groove cut in the side. The oil should flow a drop at a time into the bowl just outside the whirl of the dashers which will quickly draw it into the vortex and thoroughly mix it. Constant beating is essential to the proper incorporation of the oil and consequent thickening of the mayonnaise, which can be easily accomplished by this method without suffering from cramped fingers and necessitating frequent stops.

A shelf on which the bowl rests is supported by an ordinary bracket. This is placed at such a distance below the bottom edge of the bracket to cor-

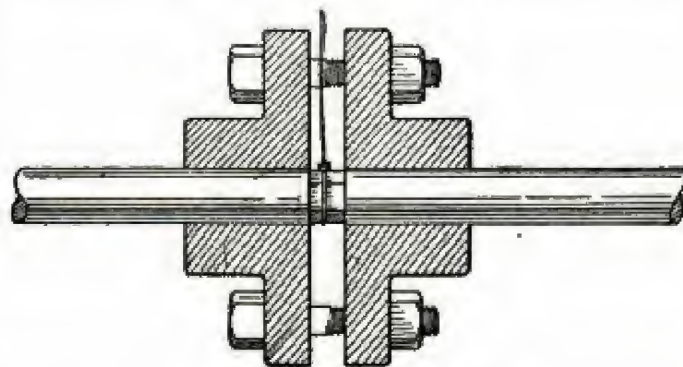
respond with the size of the egg beater used.—Contributed by Victor Labadie, Dallas, Tex.

Depositing Copper on Glass

A new method of depositing copper on glass has recently been discovered by an English investigator. A mixture of 1 part of freshly distilled phenylhydrazine and 2 parts of water is heated until the solution is clear. A warm solution of cupric hydroxide in ammonia is then added (made by precipitating sulphate of copper by potash, washing and dissolving in ammonia). The cupric hydroxide is reduced to cuprous hydroxide with evolution of nitrogen gas. A hot 10-per-cent solution of caustic potash is then added until a slight precipitation of cuprous hydroxide takes place. If the solution, in this condition, is brought in contact with a clean glass surface, a bright deposit of copper forms on it. This is thin and perfectly reflecting.

Removing Flanges from Shafting

Machinists often remove couplings or flanges from shafts or pump rods by driving them with a sledge hammer. This will batter them up or crack them, if they fit the shaft tightly. After removing the keys, spread the coupling apart and place an ordinary nut or block of steel between the ends of the shaft. This is done by swinging the nut in place with a string as shown in the sketch. All that is required to re-



Nut between Shafts

move the coupling parts is to turn up the nuts on the bolts.

If the part comes off without start-

ing the other, place a piece of heavy steel plate across the hole of the removed part and swing the nut in position. It is now ready to push out the shaft by turning up the nuts.—Contributed by J. Kotanchick, Ran-Shaw, Pa.

Writing on Blueprints

To write notes or dimensions on blueprints use a pen dipped in saleratus water, or rub a cloth saturated with the solution on the print and write with a pencil on the resulting white spot.

Placing Fibroid Filler in a Friction-Drive Automobile

The usual way of placing fibroid fillers is to take the secondary shaft from the machine and slip the ring over the end. This requires considerable time. The following method will only require an hour's time.

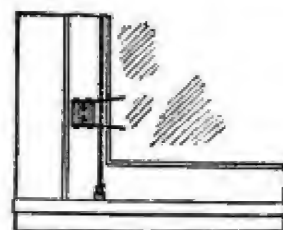
Saw the filler with a very fine saw diagonally across the driving face through one of the holes. This will allow the ring to spring apart and slip over the shaft without removing it from the machine. This cutting of the ring will not damage it, as the bolt goes through both ends and holds them together.—Contributed by Earl R. Hastings, Corinth, Vt.

Window Sash Lock and Adjuster

A device that will serve to lock a window and to keep the sash in position when raised can be easily made of two pieces of heavy spring metal, $\frac{1}{2}$ by 3 in.; a piece of hardwood, 1 by $1\frac{1}{2}$ by $\frac{3}{4}$ in.; two screws; some bolts, and a length of heavy wire.

Drill two $\frac{3}{8}$ -in. holes for screws, one $\frac{1}{2}$ in. from the end and the other $\frac{1}{2}$ in. from the first hole; then drill a $\frac{1}{8}$ -

in. hole 2 in. from the end A and bend $1\frac{1}{2}$ in. from the end as shown by the dotted line. Drill two holes through the block on the $\frac{3}{4}$ by $1\frac{1}{2}$ -in. face and



Lock Attached to Window

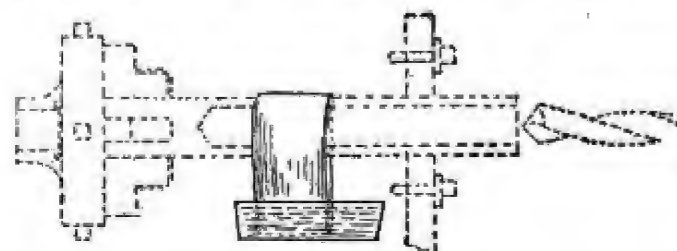
on the center line of the 1 by $1\frac{1}{2}$ -in. face. Drill two screw holes as shown at B.

The two pieces of metal are fastened to the block with bolts and the block is fastened to the sash with screws. The wire is fastened to the top of the window casing with a screweye and run through the two holes in the metal and fastened tightly with another screweye to the window sill.

The lock is released by pressing the two pieces of metal toward each other with the thumb and forefinger, and when the pressure is released the two springs will catch on the wire and hold the sash wherever located.—Contributed by P. H. B.

Cooling Work in a Lathe

Having a number of shafts to make, I had considerable trouble in keeping them cool while drilling until I made the simple little device shown in the sketch. It consists of a tin pan of cold water and a piece of cloth or flannel, preferably the latter, long enough to reach over the shaft and into the pan

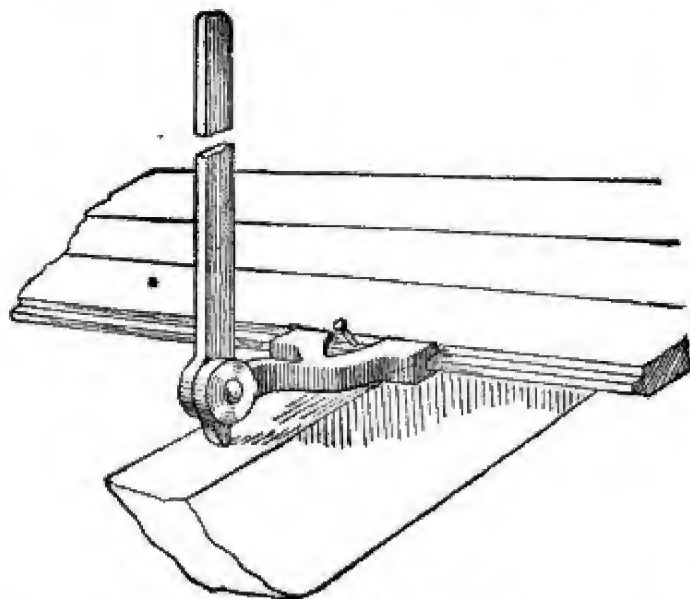


Feeding Water on Shaft

of water the same as a belt. As the water becomes warm it should be changed.—Contributed by Arthur W. Andrews, Brooklyn, N. Y.

Lever for Laying Flooring

Recently I had several thousand feet of matched flooring to lay and it necessitated some kind of a tool to draw the joints together on winding pieces.



Drawing Boards Together

I designed a tool to meet the emergency which does the work to perfection. The sketch shows its construction and how it is applied to the boards. It consists of a lever to which a grooved and notched arm is pivoted. The groove fits the tongue on the boards and the notch provides a space for driving the nail.—Contributed by S. J. Heath, Lestershire, N. Y.

Making Use of a Table-Board Case

The extra case of table boards finds no place in the ordinary kitchen where they will be out of the way and kept in good condition. If a board and covering is placed on one side and a curtain fastened to the ends and front the rack can be used for a window seat, or it can be placed on brackets and used for a shelf. When a board is wanted the curtain is raised and the board pulled out.—Contributed by C. H. Floyd, Elwood, Ind.

Ⓐ good bushing for sheave wheels, pulleys, etc., can be made of a piece of brass tube.

Green-Gold Finishes

To produce a good green-gold finish on articles at a fair cost, that neither blends to the shades of yellow or gray, but is purely green in shade and tone and cannot be termed as a yellowish or silver-green, is one of many irritating features of the electro-plating art. This is especially so when a dark or antique gold is called for.

I was called upon some time ago to produce a dark green that was green all over, both in background, as well as on the high lights, and after considerable experimenting with different chemical agents, such as lead, sodas, antimony, cadmium and nitrates, I found that the best results could be obtained from a solution containing arsenic.

I may state that it requires considerable care in the manipulatory process connected with the production of the finish obtained from the following formula:

Water	1 qt.
Potassium cyanide	3 oz.
Potassium ferro-cyanide	1 oz.
Caustic potash	1 stick
Ammonium chloride	1 oz.
Gold as perchloride	2 dwt.

Dissolve nitrate of silver in water, crystals are best, and after having the above solution in working condition suspend a platinum anode on the negative and one on the positive pole and set in action. While working, add a little of the nitrate-of-silver solution at a time until deposit shows green, then add, a drop at a time, a solution of arsenic that has been thoroughly cut and boiled with potassium cyanide until the green deposit shades over to a deep green smut. When the high lights are relieved with bicarbonate of soda on articles plated in this solution, which is used cold, they show out in a deep, rich green color.

It can be readily seen by the complication of metals and chemicals used, that this solution requires the utmost care in handling, making, keeping and working, but like everything else, it is no trouble when you get used to it and can be placed in the same class as a brass solution, so far as the plater is concerned.

Rejuvenating Old Awnings

A faded awning may be made as good as new, and possibly better, by painting it. Paint alternate stripes white and red or brown, allow time to dry, and the awning will look as bright as new; also, it will make the cloth waterproof.

Pin strips of paper on the cloth as wide as the stripes desired and paint between them. This will make the painting easy.—Contributed by Maurice Baudier, New Orleans, La.

A Soft-Faced Hammer

A soft hammer, which is very handy in removing dents from copper or sheet metal of any kind, may be made in the following manner:



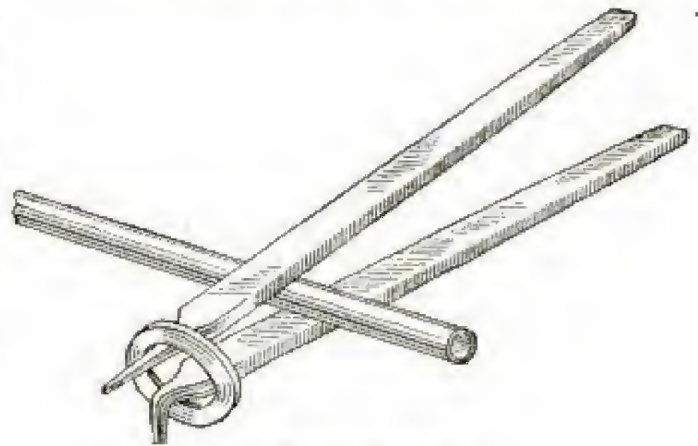
Wood Plugs in a Pipe

Procure a piece of steel or iron tube and cut it 2 in. long and drill a hole in the center for the handle. Wedge the handle in the ordinary way and cut two wood plugs, slightly tapering, to fit the ends of the tube. The plugs may be removed and new ones inserted at any time. Rawhide is excellent to use instead of the wood as it will last much longer. No dimensions are given as the hammer can be made in any size.—Contributed by John L. Waile, Cambridge, Mass.

Turning Pipes with Files

Almost every person has in his home tool chest a wrench of some kind for doing odd jobs that do not require a mechanic, but not everyone has a pipe wrench. It often happens that a tool of this kind is required for turning pipe or holding anything round. An emer-

gency wrench of this kind can be made of two files and an ordinary washer. The tang on one of the files is bent at



Position of Files

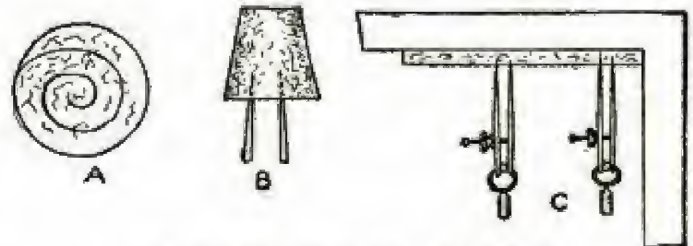
right angles and the ends of both slipped into the washer as shown. The manner of using the device is obvious.—Contributed by Joseph Olesen, Milwaukee, Wis.

Shifting Gears on an Automobile

When shifting gears on an automobile, disengage the clutch quickly and shift the gears with a quick push or pull. At the same time close the throttle almost tight and allow the clutch to come back quickly, as soon as the gears have been shifted.

Protecting Tool Edges in a Chest

The illustration A shows how to cut an ordinary cork to get long strips for attaching to the inside surface of a tool chest to protect the edge or points of tools. The strips are tacked or glued to the inside of the drawer or box. The points of dividers may be protected by sticking them into a cork as shown at

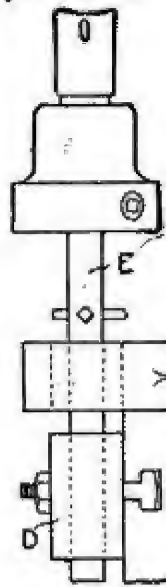


Tool Edges Protected with Cork

B. The strip protecting the tools in a chest is shown at C.—Contributed by J. F. Tholl, Ypsilanti, Mich.

Boring in a Drill Press

Having some cast-iron arms to bore out for bushings, we naturally turned to the lathe, but found the pieces were just too big to swing over the ways.



After looking our tools over we decided to make use of the drill press, which was accomplished as follows:

The arms were laid on the block B of the press

Boring Bar in Drill Chuck

and fastened down. One end was flat, the cross section was of irregular form, and under this the knee or angle plate C was bolted. This served to locate the arms at once and leveled them up by this surface so that all were duplicates. To the other side of the block was bolted a casting, D, having a 1-in. hole through it. A boring bar, E, was provided, placed in the chuck of the drill press, and the chuck centered over the hole D. The castings were then trued up by the bar and the boring begun. The job was done as well as in the lathe and almost as quickly.—Contributed by Donald A. Hampson, Middletown, N. Y.

Preventing the End Grain of Wood from Checking

Blocks of wood stored for use in turning are usually coated on the ends with oil to prevent cracks and checks during the drying-out process. A most desirable substitute for oil is paraffin melted and poured lightly over the ends. This is clean and not greasy to handle, answers every requirement and has found favor with the best wood-workers.

Cleaning Brass Fixtures

Brass rules used in a printing office, or brass fixtures of any kind, can be cleaned with acetic acid. This is the best and cheapest cleaner obtainable and is a harmless substance to use. Acetic acid is strong vinegar and can be purchased at any local drug store. The action against fly specks is hastened by the addition of salt to the acid. This substance is not harmful to the hands and can be used without injury while most other cleaners are harmful. The brass should be wiped with a dry cloth after the acid has removed the tarnish. The acid is also excellent for washing grease from glass articles, especially fly-specked windows.—Contributed by Loren Ward, Des Moines, Iowa.

Smooth Edge on a Drawing Board

Fasten a strip of smooth oilcloth of any color over the front edge of a drawing board with small tacks well driven down so that all the slivers and rough spots on the wood are covered. The oilcloth is smooth and does not wear the clothing, which makes it unnecessary to wear an apron.—Contributed by W. E. Morey, Chicago.

Substitute Turnbuckles for Aeroplanes

A very inexpensive way to fasten brace wires on gliders and aeroplanes is shown in the sketch. The device takes the place of turnbuckles. The



Fastening Brace Wires

rings that are attached in the line can be purchased from any local harness shop or hardware store. A wire loop with a ring and a screwdriver is used to draw the ends together as shown in the first part of the sketch. A piece of copper wire is then used to connect the rings as shown complete in the second part of the sketch. This sub-

stitute turnbuckle has been used with success on gliders carrying two men.—Contributed by Don Mac Kean, Alameda, Cal.

Thread-Cutting Dies

Thread-cutting dies cannot be expected to cut cleanly and well without rake. This rake or lack of it makes quite a difference between a cutting die and one that only scrapes the metal off. The cutting edge of each "land" of the die should be made an acute angle with a line passing through the center of the work and through the extreme point of the cutting edge. Avoid dies that cut both ways. Such dies do not cut cleanly or easily when either face is to the work and they must of necessity drag the idle cutting edges over the work and dull them. One set of bolt dies that had the cutting edges parallel to the center line, or rather if continued would form the centerline, never cut so well as might have been expected. They were ground out so that the cutting edge had rake and after that they always cut nicely.

Preventing Work Chattering in a Lathe

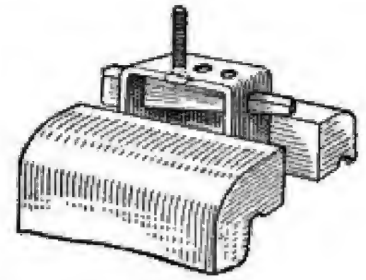
A simple method to prevent chattering in lathe work is as follows: The chatter marks may be removed by grinding the tool at an angle so that its broad edge will keep from falling into the old chatter marks.

The line AB in the sketch represents the cutting edge of the tool as the first cut was taken, and the line CD is the slant that the tool should be ground so that its cutting edge will cut across the chatter marks.

Jumpers and overalls used when working about acid can be made impervious by rubbing the goods carefully all over with a piece of beeswax or paraffin, and ironing with a warm smoothing iron.

Holding Screws while Filing

A clamp for holding screws while filing the ends can be made of a $\frac{3}{4}$ by $\frac{1}{8}$ -in. strip of steel about 6 in. long and a metal wedge. The strip of steel is bent U-shaped and notches are cut for the wedge. Holes are drilled in the top for different-sized screws. The manner of using the clamp is shown in the sketch.—Contributed by I. B. Spittel, Baltimore, Md.



Gaskets for Automobile Transmission

Cut from a piece of good, smooth and medium-weight brown paper the shape of the gasket and soak it in cylinder oil. Place the gasket in position and draw the parts together. If this method is properly carried out, an oil-tight joint, one that will hold for a considerable length of time, will be secured.—R. B. Hollaway, Lydon, Vermont.

Cutting Brass Tubes

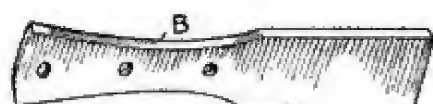
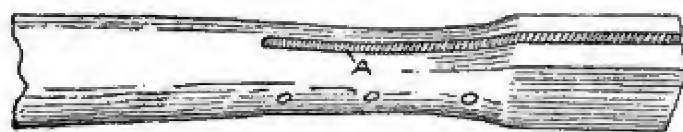
When cutting brass tubes by hand, use the back of the hacksaw blade held in the ordinary frame. This cuts very fast and works fully as well as a regular tube-cutting saw on very light tubes. Tubing will collapse when held in a vise unless it is filled or held in circular jaws. To put a piece of round steel into the tube is good, and it need not fit closer than $\frac{1}{32}$ in., for the elasticity of the tube will make up for the difference. Stock within this limit is usually at hand.

For flaring the ends of brass tubes, punches and dies are usually necessary, but if the flare does not have to be very great or too accurate, it can be accomplished by the use of a punch, or punches, alone.

Always use a lead or soft-faced hammer to drive out arbors.

Strengthening a Hammer Handle

A nail-pulling hammer handle may be made strong enough to stand hard usage without breaking by placing a

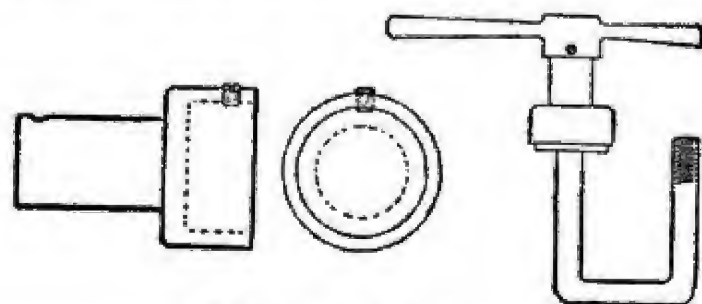


Metal Strip in Handle

piece of metal in the slot A of the handle shown in the sketch. The slot is cut in with a rip saw past the small part of the handle. The metal B is cut to fit the slot, then drilled, and the wood countersunk for rivets. The rivets are well hammered down and smoothed off level with the surface of the handle. The hammer is fastened on in the usual manner.—Contributed by Irl R. Hicks, Hallsville, Mo.

Diestock Extension

In the sketch is shown an extension for a diestock for threading the ends of U-bolts. It is turned from machine



Extension in Diestock

steel in the shape indicated in the diagram. This tool is especially adapted for making clips for automobile springs.—Contributed by Urban A. Towle, Portland, Me.

☞ When fishing with a drop net place a fresh water worm in a clear medicine bottle and tie it in the net. The worm will be greatly magnified. A ground worm in salt water will go through contortions that will attract the fish.

Turning a Typewriter Ribbon

It may interest those who use a typewriter to know that the life and usefulness of a ribbon may be almost doubled by simply turning it over after it becomes worn on one side and the impression becomes faint. I discovered this recently. Knowing that ribbons did not last long, six weeks being the limit with mine, I reversed the ribbon and was delighted to find it as good as when new. My ribbons last twice as long as when using only one side.—Contributed by A. Ashmun Kelley, Malvern, Pa.

Keeping Lines from Under the Ends of Singletrees

A simple method of keeping a line from catching beneath the end of a singletree is to connect the clevis on



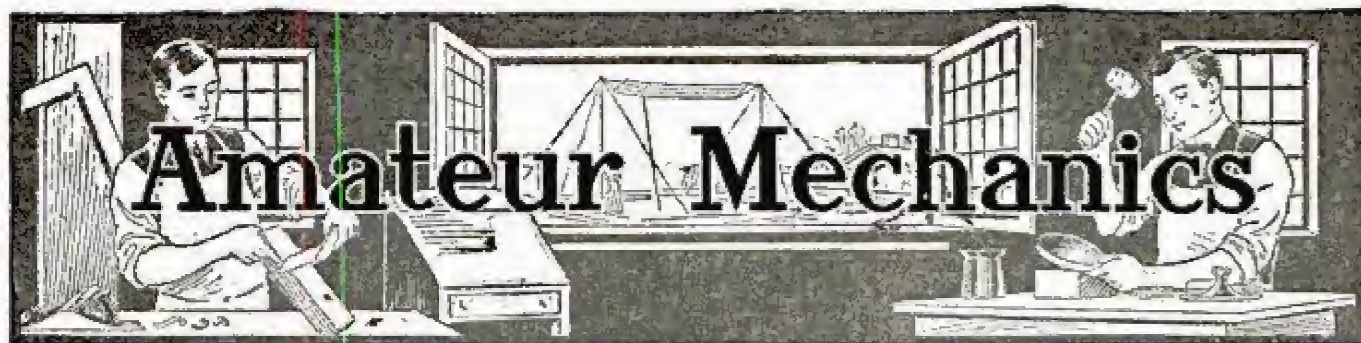
Bar of Metal on Singletrees

each singletree with a rod or strap iron. The method of applying the rod is shown in the sketch.

Stay-Bolt Repair on a Boiler

We were running an engine in the backwoods at 75 lb. pressure and had a couple of stay bolts to fix. They had been leaking so long that the iron around the stay bolts had rusted to almost a feather edge. There was not enough metal left to hold an ordinary stay bolt, although the boiler was in good shape otherwise. We used $\frac{5}{8}$ -in. bolts and put large washers and double nuts with asbestos packing instead of riveting the ends. They made a permanent and perfect repair.—Contributed by Marion P. Wheeler, Greenleaf, Oregon.

☞ If cotterpins are rubbed with flake graphite, they will not rust and can be easily removed.



Homemade Electric Stove

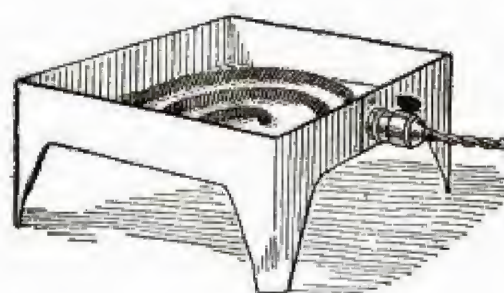
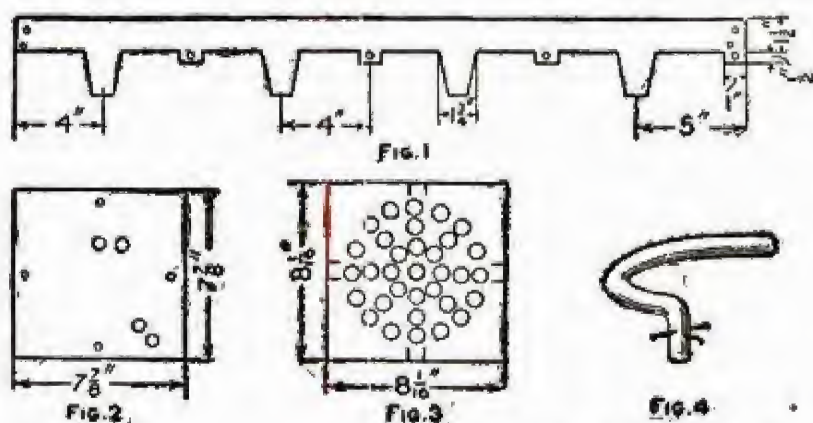
By J. F. THOLL

The construction of an electric stove is very simple and can be made by any home mechanic having a vise and hand drill. The body is made of sheet or galvanized iron, cut out and drilled as shown in Fig. 1.

Each long projection represents a leg which is bent at right angles on the center line by placing the metal in the jaws of a vise and hammering the

One end of the coiled rod is shown in Fig. 4. This illustrates how two pins are inserted in holes drilled in opposite directions for pins to hold the coil on the bottom plate. The coiled rod is $\frac{3}{16}$ in. in diameter and 27 in. long. The rod is wrapped with sheet asbestos, cut in $\frac{1}{2}$ -in. strips.

The length of the heating wire must be determined by a test. This wire



Pattern for Parts of the Electric Stove

metal over flat. If just the rim is gripped in the vise, it will give a rounding form to the lower part of the legs. The small projections are bent in to form a support for the bottom.

The bottom consists of a square piece of metal as shown in Fig. 2. Holes are drilled near the edges for stove bolts to fasten it to the bottom projections. Two of the larger holes are used for the ends of the coiled rod and the other two for the heating-wire terminals. The latter holes should be well insulated with porcelain or mica. The top consists of a square piece of metal drilled full of holes, as shown in Fig. 3. Four small ears are turned down to hold the top in place.

can be purchased from electrical stores. Stovepipe wire will answer the purpose when regular heating wire cannot be obtained. The wire is coiled around the rod covered with asbestos so that each coil will not be in contact with another coil. If by trial the coil does not heat sufficiently, cut some of it off and try again. About 9½ ft. of No. 26 gauge heating wire will be about right. The connection to a light socket is made with ordinary flexible cord.

⚠ Ink usually corrodes pens in a short time. This can be prevented by placing pieces of steel pens or steel wire in the ink, which will absorb the acid and prevent it from corroding the pens.

Automatic-Closing Kennel Door

When the neighborhood cats are retired for the night and there is nothing more to chase, my fox terrier seems to realize that his usefulness

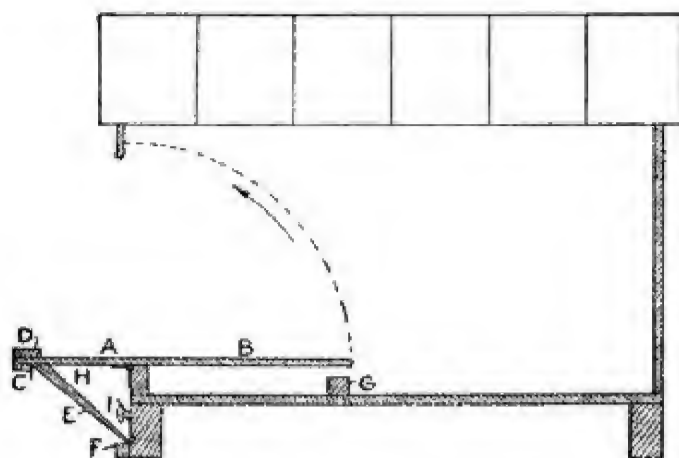


Diagram of Closing Door

for the day is over and begs to be put in his kennel that he may not bark at the moon as some dogs are apt to do. This necessitates my putting him out at a time when it may not be convenient. Frequently in stormy weather this is a disagreeable duty and I found a way to obviate it by making a trapdoor device for his kennel as shown in the sketch whereby he may lock himself in when he crosses the threshold.

The outer half A of the hinged trapdoor is made heavier than the inner half B by a cleat, C, and a strip, D, to cause the door to swing shut. The tripper stick E is set between cleats C and F to hold the door open. When the dog steps on the inner half of the trapdoor B, it falls to stop G, releasing tripper stick E (which is heavier on the top end H) to cause it to fall clear of the path of the trapdoor. The door then swings shut in the direction of the arrow, the latch I engaging a slot in the door as it closes, and the dog has locked himself in for the night. The latch I is made of an old-fashioned gate latch which is mortised in the bottom joist of the kennel. When releasing the dog in the morning the door is set for the evening.—Contributed by Victor Labadie, Dallas, Texas.

Polishing Cloths for Silver

Mix 2 lb. of whiting and $\frac{1}{2}$ oz. of oleic acid with 1 gal. of gasoline. Stir and mix thoroughly. Soak pieces of gray outing flannel of the desired size—15 by 12 in. is a good size—in this compound. Wring the surplus fluid out and hang them up to dry, being careful to keep them away from the fire or an open flame. These cloths will speedily clean silver or plated ware and will not soil the hands.

In cleaning silver, it is best to wash it first in hot water and white soap and then use the polishing cloths. The cloths can be used until they are worn to shreds. Do not wash them. Knives, forks, spoons and other small pieces of silver will keep bright and free from tarnish if they are slipped into cases made from the gray outing flannel and treated with the compound.

Separate bags for such pieces as the teapot, coffee pot, hot-water pot, cake basket and other large pieces of silverware will keep them bright and shining.—Contributed by Katharine D. Morse, Syracuse, N. Y.

A Book-Holder

Books having a flexible back are difficult to hold in an upright position when copying from them. A makeshift combination of paperweights and other books is often used, but with unsatisfactory results.



Fig. 1



Fig. 2

Box Corner Makes a Book Holder

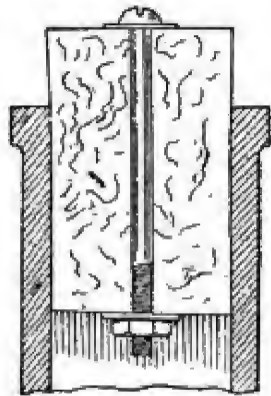
The book-holder shown in the sketch will hold such books securely, allow

the pages to be turned easily and conceal the smallest possible portion of each page.

The holder can be cut out of a box corner and fitted with two screweyes, which have the part shown by the dotted lines at A (Fig. 1) removed. The length of the back board determines the slope for the book rest.—Contributed by James M. Kane, Doylestown, Pa.

Clamping a Cork

It is aggravating to continually break the cork of the stock mucilage bottle because of its sticking to the neck of the bottle after a supply has been poured out. If a stove bolt is inserted lengthwise through the cork with a washer on each end and the nut screwed up tightly, as shown in the sketch, the cork



may be made to last longer than the supply of mucilage and can be placed in a new bottle and used over and over again.

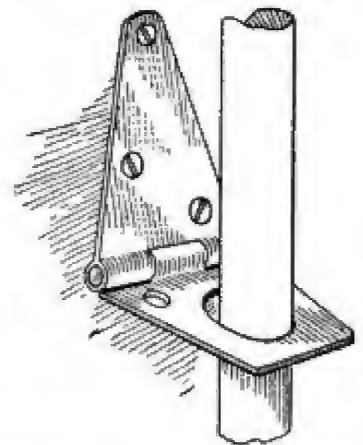
Withdrawing Paper from under an Inverted Bottle

Invert a bottle on a piece of paper near the edge of a table top and ask any one to remove the paper without overturning the bottle. They will at once jerk the paper with the result that the bottle will turn over. To remove the paper just strike the table top with your right fist while pulling the paper slowly with your left hand. As you strike the table the bottle will jump and release the paper.—Contributed by Maurice Baudier, New Orleans, La.

Ⓐ bone collar button makes a good substitute for a plug in repairing a puncture in a single-tube bicycle tire.

Broom Holder Made of a Hinge

The broom holder shown in the sketch is made of an ordinary hinge with one wing screwed to the wall. The loose wing has a large hole drilled in it to receive the handle of the broom. The manner of holding the broom is plainly shown in the sketch. — Contributed by Theodore L. Fisher, Waverly, Ill.

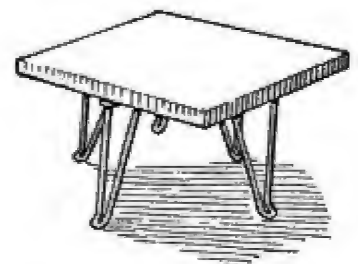


Making Proofs before the Negative Dries

A correspondent of Camera Craft makes proofs from his developed, but unfixed, negatives, by squeezing a sheet of wet bromide paper into contact with the wet film and giving an exposure several times longer than would be required under ordinary conditions, using the paper dry. If the developer is well rinsed out of the film, the exposure to artificial light necessary to make a print will have no injurious effect upon the negative, which is, of course, later fixed and washed as usual.

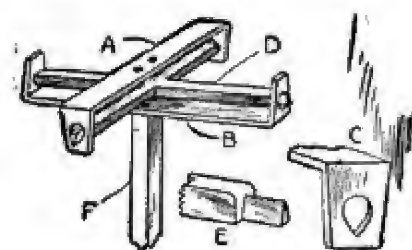
Flower-Pot Stand

A very useful stand for flower pots can be made of a piece of board supported by four clothes hooks. The top may be of any size suitable for the flower pot. The hooks which serve as legs are fastened to the under side of the board in the same manner as fastening the hook to a wall. —Contributed by Oliver S. Sprout, Harrisburg, Pa.



A Line Harmonograph

As an apparatus capable of exciting interest, probably nothing so easily constructed surpasses the harmonograph.



Your attention will be completely absorbed in the ever changing, graceful sweep of the long pendulum, the gyrations of which are faithfully recorded in the resulting harmonogram.

A careless impetus given to the pendulum may result in a very beautiful harmonogram, but you may try innumerable times to duplicate this chance record without success. No two harmonograms are exactly alike. The harmonograph, while its pendulum swings in accordance with well known natural laws, is exceedingly erratic when it comes to obeying any preconceived calculations of its operator. In this uncertainty lies the charm. If time hangs heavily or a person is slightly nervous or uneasy, a harmonograph is a good prescription.

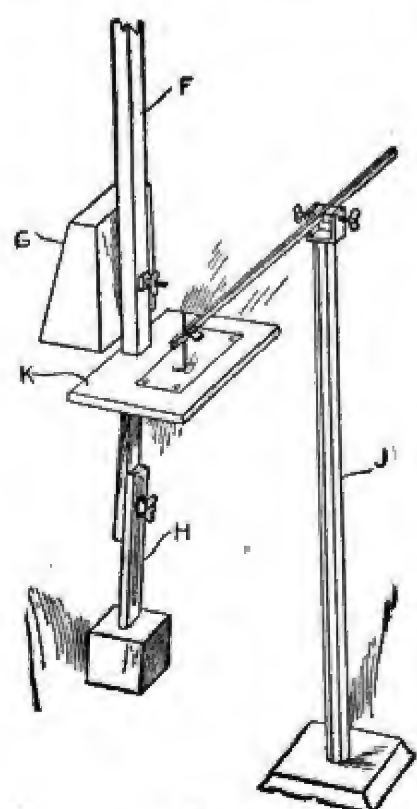


Fig. 1

The prime essential in a well working harmonograph is a properly constructed universal joint. Where such a joint is made with pivots for its bearings, one pair of pivots are very liable to have more friction than the other, which retards the movement

and causes the harmonograph to undergo a continuous change of axis. To obviate this difficulty, the joint should be made similar to those used on scales. The general appearance of such a joint is shown in the first illustration, Fig. 1. Stirrups A and B are made of $\frac{7}{8}$ by $\frac{1}{4}$ -in. metal. Holes are drilled in each end of these stirrups and filed out as shown at C. The two holes shown in the center of the stirrup A are drilled to fasten the apparatus to the ceiling. Two corresponding holes are drilled in B to fasten the long pendulum F to the joint. The cross of the joint D has the ends shaped as shown at E. The rounded shoulder on E is to prevent the cross from becoming displaced by a jar or accident. The ends of the cross are inserted through the holes C of the stirrups, then slipped back so the knife edges engage in the V-shaped holes of the stirrups. The cross must be so made that the knife edges will be in the same plane. This can be determined by placing two of the knife edges on the jaws of a vise and then laying two rules across the other two edges. The rules should just touch the jaws of the vise and the two knife edges of the cross. This makes a universal joint almost free from friction and, what is most important, prevents the pendulum from twisting on its own axis.

The pendulum F should be made of ash or oak, $1\frac{3}{4}$ by 2 in., with a length depending on the height of the ceiling. A length of 7 ft. is about right for a 10-ft. ceiling.

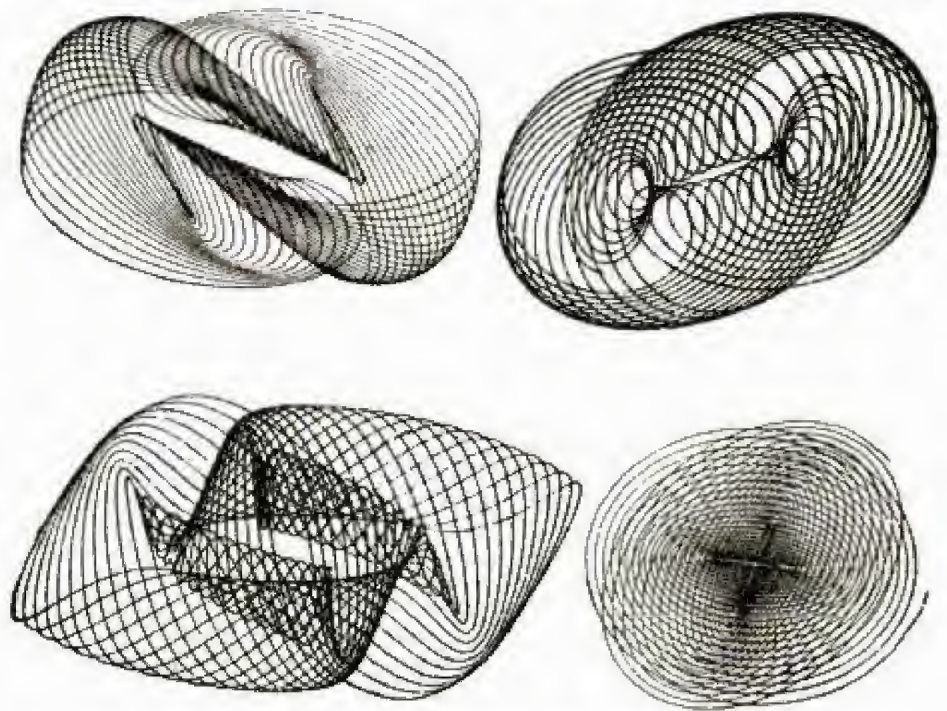
A small table or platform, K, as shown in the lower part of Fig. 1, is fastened to the lower end of the pendulum as a support for the cards on which harmonograms are made. A weight, G, of about 30 or 40 lb.—a box filled with small weights will do—is attached to the pendulum just above the table. Another weight of about 10 lb. is attached as shown at H. A pedestal, J, provides a means of support for the stylus. The stylus arm

should have pin-point bearings, to prevent any side motion.

The length of the short pendulum H, which can be regulated, as shown in Fig. 1, should bear a certain and exactly fixed relation to the length of the main pendulum, for the swinging times of pendulums are inversely proportionate to their lengths, and unless the shorter pendulum is, for instance, exactly one-third, one-fourth, one-fifth, etc., as long as the other, that is, makes respectively 3, 4 or 5 swings to one swing of the long pendulum, they will not harmonize and a perfect harmonogram is not obtained.

A good stylus to contain the ink is easily made from a glass tube $\frac{1}{4}$ in. in diameter. Heat the tube in an alcohol or Bunsen flame and then, by drawing the two portions apart and twisting at the same time, the tube may be drawn to a sharp point. An opening of any desired size is made in

the point by rubbing it on a whetstone. Owing to the fact that the style of universal joint described has so little friction, the stylus point must be very



Lines Made with the Harmonograph

fine, or the lines will overlap and blur. A small weight, such as a shoe buttoner, placed on the arm near the stylus will cause enough friction to make the pendulum "die" faster and thus remedy the trouble.—Contributed by Wm. R. Ingham, Rosemont, Arizona.

Cutting Circular Holes in Thin Sheet Metal

In arts and crafts work, occasion often arises to cut a perfectly circular hole in sheet copper or brass. To saw and file it out takes time and skill. Holes up to 3 in. in diameter can be cut quickly and accurately with an ordinary expansive bit.

Fasten the sheet metal to a block of wood with handscrews or a vise. Punch a hole, with a nail set or punch, in the center of the circle to be cut, large enough to receive the spur of the expansive bit. A few turns of the brace will cut out the circle and leave a smooth edge.—Contributed by James T. Gaffney, Chicago.

Key Card for Writing Unreadable Post Cards

A key card for use in correspondence on postals that makes the matter unreadable unless the recipient has a duplicate key card is made as follows: Rule two cards the size of postal, one for the sender and one for the receiver, dividing them into quarters. These quarters are subsequently divided into any convenient number of rectangular parts—six in this case.

These parts are numbered from one to six in each quarter beginning at the outside corners and following in the same order in each quarter. Cut out one rectangle of each number with a sharp knife, distributing them over the

whole card. Then put a prominent figure 1 at the top of one side, 2 at the bottom and 3 and 4 on the other side. The numbering and the cutouts are

is worked by a string passing through the top of the bench and should be weighted on the other end to facilitate the automatic downward movement.

	4	4	1
2	5	5	
	6	6	3
3	6		3
2		5	2
1	4		1

FIG. 1

READ	YOURSELF	WRITTEN	THE
WORLD	SO	POSTED	POPULAR
MECHANICS	ON	YOU	IN
CAN	SCIENCE	MAGAZINE	THE
PROGRESS	TO	AND	UNDERSTAND
IT	MECHANICS	KEEP	OF

FIG. 2

READ	1	
		POPULAR
MECHANICS		
	MAGAZINE	
TO		
	2	KEEP

FIG. 3

	YOURSELF	2	
		POSTED	
	ON		
			THE
PROGRESS			
			OF

FIG. 4

	3	THE
WORLD		
		IN
	SCIENCE	
		AND
	MECHANICS	

FIG. 5

	4	WRITTEN
	SO	
		YOU
CAN		
		UNDERSTAND
IT		

FIG. 6

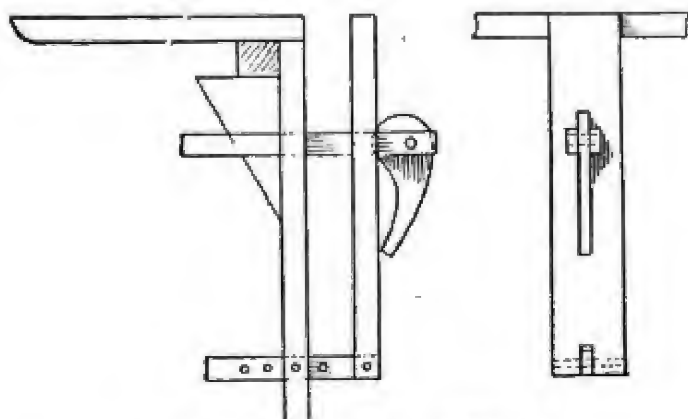
The Key Card

shown in Fig. 1. The two key cards are made alike.

The key card is used by placing it over a postal with the figure 1 at the top and writing in the spaces from left to right as usual, Fig. 3, then put 2 at the top, Fig. 4, and proceed as before, then 3 as in Fig. 5, and 4 as in Fig. 6. The result will be a jumble of words as shown in Fig. 2, which cannot be read to make any sense except by use of a key card.—Contributed by W. J. Morey, Chicago.

Homemade Carpenter's Vise

The sketch shows an easily made, quick-working wood vise that has proved very satisfactory. The usual screw is replaced by an open bar held on one end by a wedge-shaped block,



Vise Made Entirely of Wood

and the excess taken up on the other end by an eccentric lever. The wedge

The capacity of the vise, of course, depends on the size and shape of the wedge-shaped block.—Contributed by J. H. Cruger, Cape May City, N. J.

Toning Blue on Bromide and Platinum

After some experimenting to secure a blue tone on bromide prints, a correspondent of the Photographic Times produced a very pleasing bluish green tint by immersing the prints in a solution composed of 30 gr. of ferricyanide of potash, 30 gr. citrate of iron and ammonia, $\frac{1}{2}$ oz. acetic acid and 4 oz. of water. After securing the tint desired, remove the prints, rinse them in clean water for a few minutes, and then place them in a dilute solution of hydrochloric acid. Wash the prints thoroughly and hang them up with clips to dry.

Cutting Loaf Bread

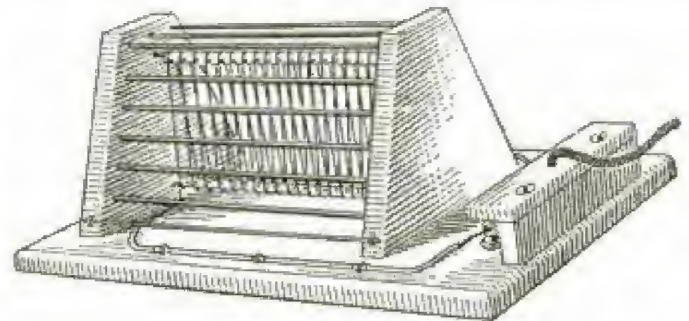
When cutting a loaf of bread do not slice it from the outer crusted end. Cut through the center, then cut slices from the center toward the ends. The two cut surfaces can be placed together, thus excluding the air and keeping the bread fresh as long as there is any left to slice.—Contributed by L. Alberta Norrell, Augusta, Ga.

How to Make an Electric Toaster

The electric toaster shown in the sketch is not hard to make. The framework comprising the base and the two uprights may be made either of hardwood or asbestos board, says Popular Electricity. If constructed of the former, the portion of the base under the coil, and the inside surfaces of the two uprights should be covered with a $\frac{1}{8}$ -in. sheet of well made asbestos paper, or thin asbestos board may be substituted for this lining. Asbestos board is to be preferred, and this material in almost any degree of hardness may be purchased. It can be worked into shape and will hold wood-screws. The detail drawing gives all dimensions necessary to shape the wood or asbestos board.

After preparing the base and uprights, drill 15 holes, $\frac{1}{4}$ in. deep, into the inside face of each upright to support the No. 6 gauge wires shown. The wires at the top and bottom for holding the resistance wire are covered with asbestos paper and the holes for these wires are $\frac{3}{4}$ in. from the top and bottom, respectively, of the uprights. The wires that form the cage about the heater coil and are used for a support for the toast are 15 pieces of No. 6 gauge iron wire each 8 in. long. The screws that hold the uprights in position should have the heads counter-sunk on the under side of the base. The binding-posts should now be set in position and their protecting cover-

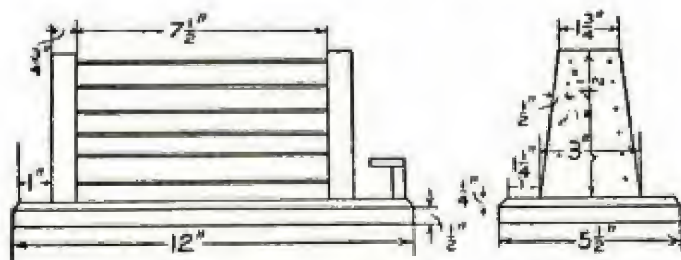
longs without fastening it and put the stretcher wires for holding the resistance wire in place. Put the asbestos paper on these and with the assistance of a helper begin winding on the heater



Toaster Complete

coil. Use 80 ft. of 18-per-cent No. 22 gauge German-silver wire. Wind the successive turns of wire so they will not touch each other and fasten at each end with a turn or two of No. 16 gauge copper wire. When this is complete have the helper hold the stretcher wires while you tip the unfastened upright out and insert the wires of the cage, then fasten the upright in place.

The wire from the binding-posts to the coil may be what is known as underwriters' wire or asbestos-covered wire No. 14 gauge, which is held in place by double-headed tacks containing an insulation at the head. These may be procured from electrical supply houses. Connect the reinforced cord and terminals to the binding screws and fasten the cover in place. This toaster will take four amperes on 110-volt circuit.



Detail of Toaster

ing containing the reinforced cord left until the other parts are finished.

To assemble, secure one upright in position using $1\frac{1}{2}$ -in. wood-screws. Place the other upright where it be-

Cabinet for the Amateur's Workshop

One of the most convenient adjuncts to an amateur's workbench is a cabinet of some sort in which to keep nails, rivets, screws, etc., instead of leaving them scattered all about the bench. A very easily made cabinet for this purpose is shown in the accompanying illustration. The case may be made of $\frac{1}{2}$ -in. white pine or white wood of a suitable size to hold the required num-

ber of drawers which slide on strips of the same material, cut and dressed $\frac{1}{2}$ in. square. The drawers are made of empty cigar boxes of uniform size,



Empty Cigar Boxes Used for Drawers

which, if one is not a smoker, may be readily obtained from any cigar dealer, as they are usually thrown away when empty.

Small knobs may be added if desired, but these are not necessary, as the spaces shown between the drawers give ample room to grasp them with the fingers. Labels of some kind are needed, and one of the neatest things for this purpose is the embossed aluminum label, such as is stamped by the well known penny-in-the-slot machines to be found in many railroad stations and amusement places.—Contributed by Frederick E. Ward, Ampere, N. Y.

☞ Photograph prints can be kept from curling when dry, by giving them the same treatment as was once used on films. Immerse for 5 minutes in a bath made by adding $\frac{1}{4}$ oz. of glycerine to 16 oz. of water.

Soldering for the Amateur

Successful soldering will present no serious difficulties to anyone who will follow a few simple directions. Certain metals are easier to join with solder than others and some cannot be soldered at all. Copper, brass, zinc, tin, lead, galvanized iron, gold and silver or any combination of these metals can be easily soldered, while iron and aluminum are common metals that cannot be soldered.

It is necessary to possess a soldering copper, a piece of solder, tinner's acid, sandpaper or steel wool, a small file and a piece of sal ammoniac. If the soldering copper is an old one, or has become corroded, it must be ground or filed to a point. Heat it until hot (not red hot), melt a little solder on the sal ammoniac, and rub the point of the copper on it, turning the copper over to thoroughly tin the point on each face. This process is known as tinning the iron and is very necessary to successful work.

After the copper is tinned you may place it in the fire again, being careful about the heat, as too hot an iron will burn off the tinning.

The parts to be soldered must be thoroughly cleaned by sandpapering or the use of steel wool until the metal shows up bright. Then apply the acid only to the parts to be soldered with a small stiff brush or a small piece of cloth fastened to a stick, or in a bent piece of tin to form a swab.

Tinner's acid is made by putting as much zinc in commercial muriatic acid as will dissolve. This process is best accomplished in an open earthenware dish. After the acid has ceased to boil and becomes cool it may be poured into a wide-mouthed bottle which has a good top or stopper, and labeled "Poison."

Place the parts to be soldered in their correct position and apply the hot copper to the solder, then to the joint to be soldered, following around with the copper and applying solder as is necessary.

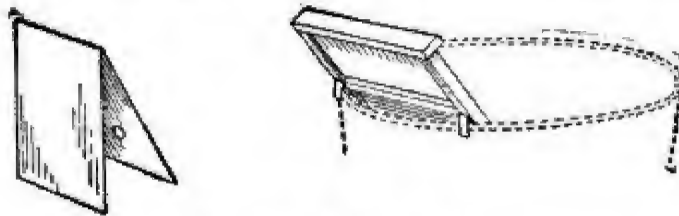
In joining large pieces, it is best to

"stick" them together in several places to hold the work before trying to get all around them. A little practice will soon teach the requisite amount of solder and the smoothness required for a good job.

In soldering galvanized iron, the pure muriatic acid should be used, particularly so when the iron has once been used.—C. G. S., Eureka Springs, Ark.

Washboard Holder

When using a washboard it will continually slip down in the tub. This is considerable annoyance, especially if a large tub is used. The washboard can be kept in place with small metal hooks, as shown in the sketch. Two of these are fastened to the back of



Clip on the Washboard

the washboard in the right place to keep it at the proper slant.—Contributed by W. A. Jaquythe, Richmond, California.

A Mission Bracket Shelf

The shelf consists of six pieces of wood A, B, C, D, E and F. The material can be of any wood. I have one made of mahogany finished in natural color, and one made of poplar finished black. The dimensions given in the detail drawings are sufficient for anyone to make this bracket. The amount of material required is very small and can be made from scrap, or purchased from a mill surfaced and sanded. The parts are put together with dowel pins.—Contributed by A. Larson, Kenosha, Wis.

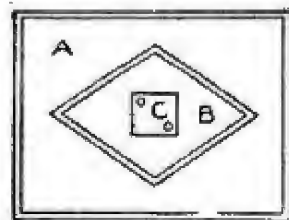
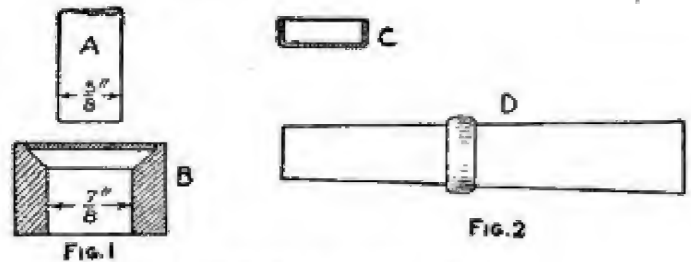


Fig. 1

How to Make a Finger Ring

While the wearing of copper rings for rheumatism may be a foolish notion, yet there is a certain galvanic action



Tools for Forming the Ring

set up by the contact of the acid in the system of the afflicted person with the metal of the ring. Apart from this, however, a ring may be made from any metal, such as copper, brass and silver, if such metals are in plate or sheet form, by the following method:

All the tools necessary are a die and punch which are simple to make and will form a ring that will fit the average finger. Take a $\frac{3}{4}$ -in. nut, B, Fig. 1, and drill out the threads. This will leave a clear hole, $\frac{7}{8}$ in. in diameter, or a hole drilled the desired size in a piece of iron plate will do as well. Countersink the top of the hole so that the full diameter of the countersink will be $1\frac{1}{4}$ in. This completes the die. The punch A, is made of a piece of $\frac{5}{8}$ -in. round iron, slightly rounded on the end so that it will not cut through the metal disk. The dimensions shown in

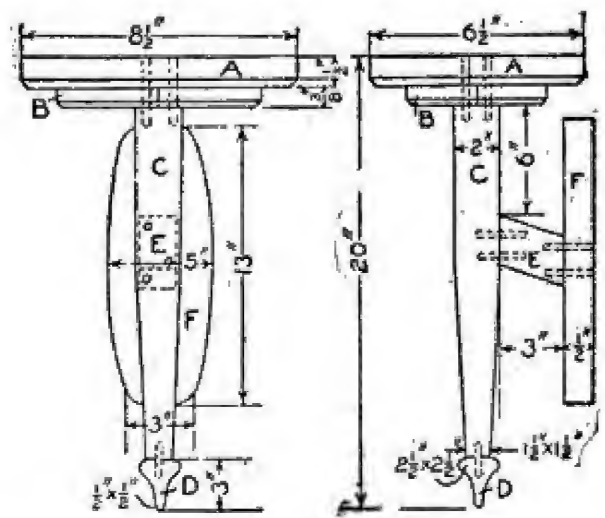


Fig. 2

Fig. 3

Details of the Wall Bracket

Fig. 1 can be changed to suit the size of the finger to be fitted.

The metal used should be about $\frac{3}{16}$ in. thick and $1\frac{1}{4}$ in. in diameter. Anneal it properly by heating and plunging in water. Lay it on the die so that it will fit nicely in the countersink and drive it through the hole by striking the punch with a hammer. Hold the punch as nearly central as possible when starting to drive the metal through the hole. The disk will come

out pan shaped, C, and it is only necessary to remove the bottom of the pan to have a band which will leave a hole $\frac{5}{8}$ in. in diameter and $1\frac{1}{4}$ in. wide. Place the band, D, Fig. 2, on a stick so that the edges can be filed and rounded to shape. Finish with fine emery cloth and polish. Brass rings can be plated when finished.—Contributed by H. W. Hankin, Troy, N. Y.

How to Bind Magazines

A great many readers of Popular Mechanics Magazine save their copies and have them bound in book form and some keep them without binding. The bound volumes make an attractive library and will always be valuable works of reference along mechanical lines. I bind my magazines at home evenings, with good results. Six issues make a well proportioned book, which gives two bound volumes each year.

The covers of the magazines are removed, the wire binders pulled out with a pair of pliers and the advertising pages removed from both sides, after which it will be found that the remainder is in sections, each section containing four double leaves or sixteen pages. These sections are each removed in turn from the others, using a pocket knife to separate them if they stick, and each section is placed as they were in the magazine upon each preceding one until all six numbers have been prepared. If started with the January or the July issue, the pages will be numbered consecutively through the entire pages of the six issues.

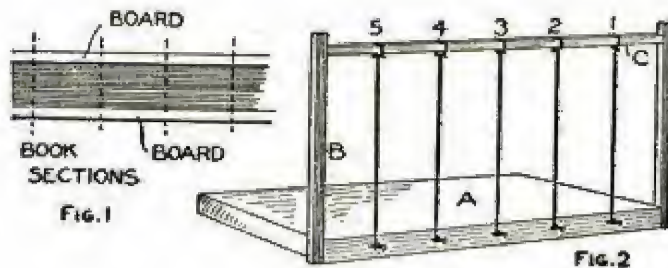
The sections are then prepared for sewing. They are evened up on the edges by jarring on a flat surface. They are then placed between two pieces of board and all clamped in a vise. Five cuts, $\frac{1}{8}$ in. deep, are made with a saw across the back of the sections, as shown in Fig. 1. Heavy plain paper is used for the flyleaves. The paper is cut double the same as the leaves comprising the sections,

making either one or two double sections for each side as desired.

A frame for sewing will have to be made as shown in Fig. 2 before the work can be continued on the book. The frame is easily made of four pieces of wood. The bottom piece A should be a little larger than the book. The two upright pieces B are nailed to the outside edge, and a third piece, C, is nailed across the top. Small nails are driven part way into the base C to correspond to the saw cuts in the sections. A piece of soft fiber string is stretched from each nail to the cross-piece C and tied.

Coarse white thread, size 16 or larger, is used for the sewing material. Start with the front of the book. Be sure that all sections are in their right places and that the flyleaves are provided in the front and back. Take the sections of the flyleaves on top, which should be notched the same as the saw cuts in the book sections, and place them against the strings in the frame. Place the left hand on the inside of the leaves where they are folded and start a blunt needle, threaded double, through the notch on the left side of the string No. 1 in Fig. 2. Take hold of the needle with the right hand and pass it to the left around the string No. 1, then back through the notch on the right side. Fasten the thread by tying or making a knot in the end and passing the needle through it. After drawing the thread tightly, pass the needle through the notch on the left side of the string No. 2, passing it around the string and

tying in the same manner as for No. 1. Each section is fastened to the five strings in the same manner, the thread being carried across from each tie from No. 1 to 2 then to 3 and so on



Frame for Sewing Sections

until all strings are tied. The string No. 5 is treated in the same manner only that the needle is run through on the left side of the string a second time, leaving the needle on the outside in position for the next section, which is fastened the same as the first, the needle being passed through the notch on the right side of the string No. 5, and then to string No. 4, passing around on the right side and back on the left and so on. Keep the thread drawn up tightly all the time.

After the sewing is completed cut the strings, allowing about 2 in. of the ends extending on each side. The fibers of these ends are separated and combed out so that they can be glued to the covers to serve as a hinge. A piece of cheesecloth is cut to the size of the back and glued to it. Ordinary liquid glue is the best adhesive to use.

Procure heavy cardboard for the covers and cut two pieces $\frac{1}{2}$ in. longer and just the same width as the magazine pages. The covering can be of cloth, leather or paper according to the taste and resources of the maker. The covering should be cut out 1 in. larger on all edges than both covers and space on the back. Place the cardboard covers on the book, allowing a margin of $\frac{1}{4}$ in. on all edges except the back, and measure the distance between the back edges of the covers across the back of the book.

Place the cardboard covers on the back of the covering the proper distance apart as measured for the back,

and mark around each one. Spread a thin coat of glue on the surface of each and lay them on by the marks made. Cut a notch out of the covering so it will fold in, and, after gluing



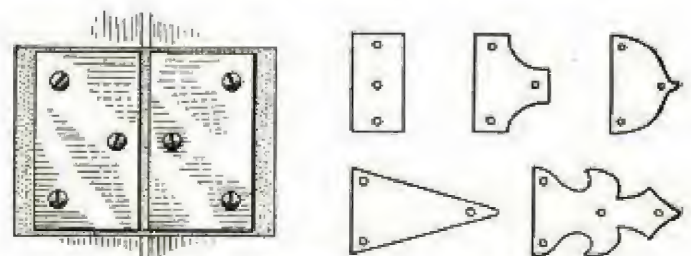
The Bound Book

a strip of paper to the covering between the covers to strengthen the back, fold over the outside edges of the covering and glue it down all around.

Place the cover on the book in the right position, glue the hinges fast to the inside of the covers, then glue the first flyleaf to the inside of the cover on both front and back and place the whole under a weight until dry.—Contributed by Clyde E. Divine, College View, Nebr.

Metal Coverings for Leather Hinges

A method of making a leather hinge work as well as an ordinary steel butt is to cover the wings with sheet metal. The metal can be fastened with nails or screws over the parts of the leather attached to the wood. Tinplate, iron



Metal Parts Screwed on Leather Hinge

hoops, zinc or thin brass cut in neat designs will make a leather hinge appear as well as a metal hinge.—Contributed by Tom Hutchinson, Encanto, Cal.

☞ A hot-water bottle held against a porous plaster will assist in quickly removing it from the skin.

INTERESTING PATENTS,



FIG. 1

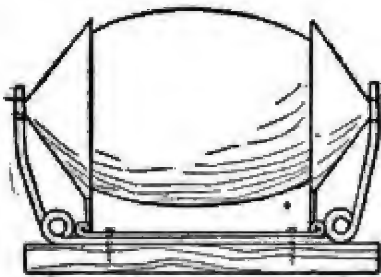


FIG. 2



FIG. 3



FIG. 4



FIG. 5

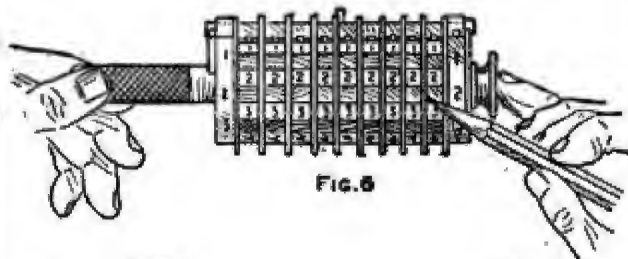


FIG. 6

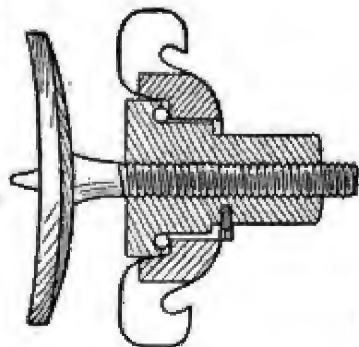


FIG. 7



FIG. 8

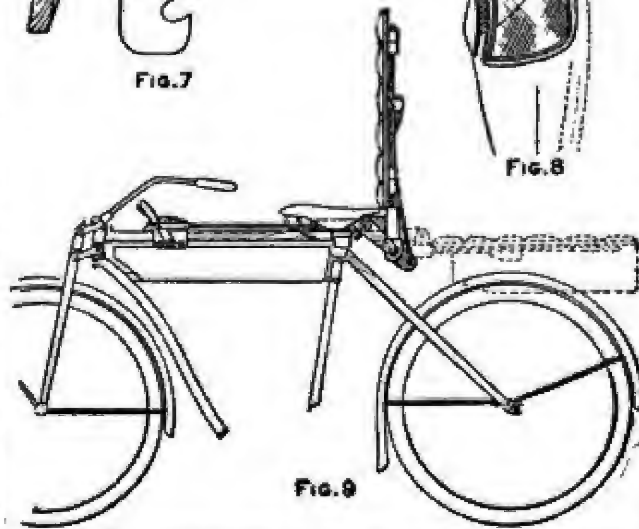


FIG. 9

PEN EXTRACTOR—Figure 1 is a gun-shaped device for extracting pens from a penholder. It comprises a pair of clamping jaws adapted to grasp the respective concave and convex sides of the pen, an operating handle connected with each of the said jaws, a push rod, and a lever. When the lever is drawn back by the finger of the operator, the clamping jaws engage the pen, and the penholder is then pushed in the opposite direction.

♦ ♦ ♦

EGG-HOLDER—Figure 2 is an egg-holding device comprising a rectangular plate, a relatively wide upright hinged to each end of the plate, and a conical-shaped holder carried by the upper end of each of the uprights. A spring arrangement connected with each holder maintains them in operative position.

♦ ♦ ♦

WINE BOTTLE PROVIDED WITH AIR-SEAL ARRANGEMENT—The bottle shown in Fig. 3 has, in combination with the neck, a chamber extending both above and below the outlet adapted to receive liquid poured from the body of the bottle when inverted, and to retain liquid so poured from the bottle when the bottle is returned to an upright position. The liquid to be poured out is finally discharged through an elongated spiral tube adapted to form a liquid seal and prevent the escape of air.

♦ ♦ ♦

A HAIR-WASHING HOOD—A water-tight hair-washing hood or bag, designed to fit over the hair and head, is shown in Fig. 4. Water enters the top of the hood through a tube, and after running through the hair makes its escape from the bottom of the bag into the washbasin or other receptacle provided to receive it.

♦ ♦ ♦

SPRINKLING STOPPER FOR BOTTLES—Figure 5 is a sprinkling attachment for bottles, comprising a hollow head composed of an upper member provided with perforations, and a lower member secured to the former and provided with an opening having outwardly extended conical walls. A hollow stopper of compressible material extends through the opening and has its upper end compressed by the walls to form a liquid-tight joint therewith.

♦ ♦ ♦

ADDING MACHINE—A little adding machine, adapted to be held and turned by the fingers in the manner shown in Fig. 6 is about to be marketed by a New York inventor.

♦ ♦ ♦

SCAFFOLDING SCREWS—Figure 7 is a screw or tie designed for the rapid connection of scaffold poles. It comprises a footplate adapted to fit the pole; a screw bolt extending from the plate; a nut having a flange; a tension plate adapted to fit loosely over the nut; interposed anti-friction devices between the nut and tension plate, and connection hooks extending from the latter.

♦ ♦ ♦

SHIELD FOR CARRIERS—A shoulder pad and body shield for icemen and others who carry articles on the shoulder is shown in Fig. 8. It is made of waterproof canvas, is held in place by means of a belt which passes around the body, and is provided with a reinforcing pad over the shoulder.

♦ ♦ ♦

BACK-REST FOR MOTORCYCLES AND BICYCLES—An extension-wing back-rest for motorcycles and bicycles is illustrated in Fig. 9. It is attached to the back of the saddle, and is moved into and out of operative position by means of a rod and lever arranged along the top of the cross-bar. When not in use, it extends backward over the rear wheel, and the wings drop down as shown. When the rest is raised into operative position, the wings automatically swing outwardly into the same plane as the central portion.

♦ ♦ ♦

COMBINED AIR PUMP AND CUSHION—An interesting spring combination for automobiles is shown in Fig. 10. It comprises a pump cylinder made fast to the connecting bolt at one end of the spring, a piston mounted in the cylinder, and a piston rod connected by means of toggle arms to the upper and lower sections of the spring, the whole being so arranged that the movement of the springs

PRACTICAL OR UNIQUE

will operate the piston in the cylinder. In the air pipe at one end of the pump cylinder is a check valve.

LADDER-CLIMBING ATTACHMENT FOR SHOES—Figure 11 is a plate designed to be quickly attached to the ordinary shoe as a safeguard against slipping in climbing ladders. The center portion of the plate is shaped to engage the rungs of the ladder, and the device is fastened to the shoe by means of straps, as shown.

SUSPENSION - FIXTURE DEVICE FOR TRUNKS—In Fig. 12 is shown a trunk having a rigid gabled upper end wall within which is contained a suspension device carried by the ridge piece, and so arranged that it is movable outward through the open front.

LOCK-JOINT PICTURE FRAMES—By means of the lock-joint picture frames shown in Fig. 13 it is possible for anyone to frame his own pictures without the necessity of mitering the ends, sawing, nailing and gluing. This recently patented lock-joint frame comes in mitered strips of any standard size from $3\frac{1}{4}$ to 30 in. long, which have tongue and groove ends, and are furnished with steel clips or staples, which are inserted in holes in the back of the strips, holding the corners firmly together.

TRAP FOR COCKROACHES—Traps for the capture of rats and mice are familiar objects to every household, but this little trap (Fig. 14), embodying the same principles of food enticement, is intended to be placed on the pantry shelves or kitchen table for the capture of cockroaches.

NEW TYPE OF NAIL-PULLER—A new form of nail-puller embodying several noteworthy features is shown in Fig. 15. It is claimed that it will pull any kind of nail from the 20-penny variety to cigar-box nails, and even cement-coated nails, and that every nail pulled comes out perfectly straight and uninjured. The puller is held in position by means of a side handle which keeps the user's hand from being pinched or smashed, and the nail is drawn by pulling down the lever, which is claimed to have a leverage strength of 120 lb.

TOGGLE-LEVER PEDOCYCLE—Several types of pedocycles have made their appearance in the past few years, but nearly all of them comprised a comparatively large wheel attached to the side of the shoe. This pedocycle (Fig. 16) has two wheels, the rear wheel constituting a hollow casing containing the gearing, and the forward wheel being simply a small leader and support for one end of the operating mechanism. Raising the foot and then allowing the weight of the body to force it downward operates the toggle levers, which action, transmitted to the gearing in the hollow casing of the rear wheel, causes the latter to revolve.

SELF-HEATING SOLDERING-IRON—Figure 17 is a soldering-iron of the self-heating type, comparatively simple and inexpensive in its construction. The point or soldering-copper is heated by means of a burner attached just back of the point on the handle. The gasoline is contained in the handle.

UNSPILLABLE CUSPIDOR—This cuspidor (Fig. 18) is not only of an unspillable type, but of a type which does not have to be righted when kicked over. It comprises an outer casing containing six openings, so arranged that one is always in position for use, and an inner spherical receptacle weighted on the bottom and supported in the outer casing by means of eight bearings let into the outer casing. The arrangement is such that the cuspidor may be kicked over the floor from one position to another without spilling its contents and without having to be righted when kicked or pushed into the desired location. One of the drawings shows the cuspidor in the act of being overturned or sent rolling across the floor, and the other shows it at rest, ready for use.

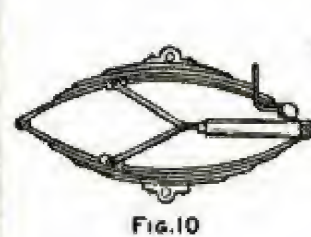


FIG. 10

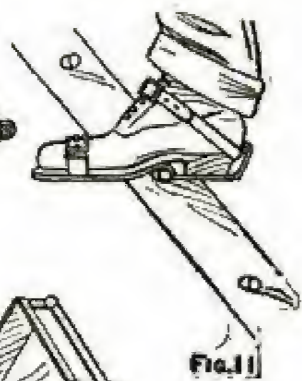


FIG. 11

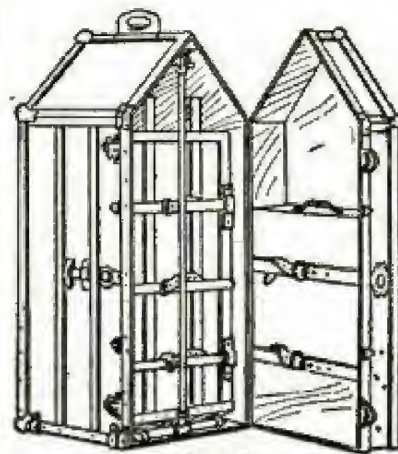


FIG. 12



FIG. 13

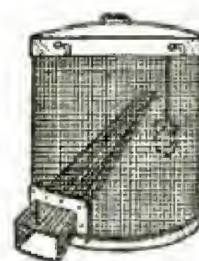


FIG. 14

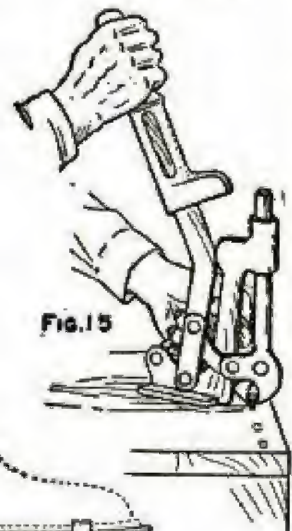


FIG. 15

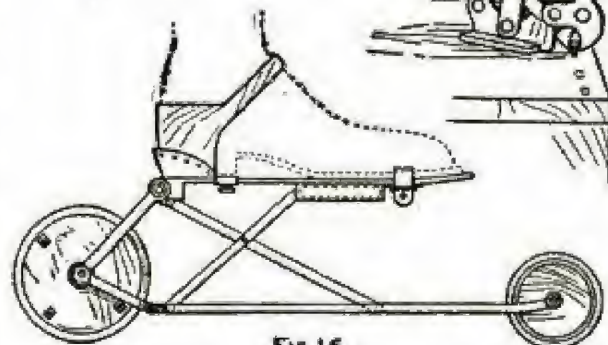


FIG. 16

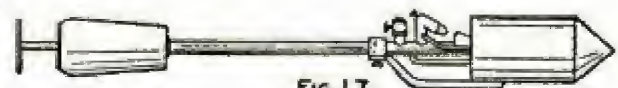


FIG. 17

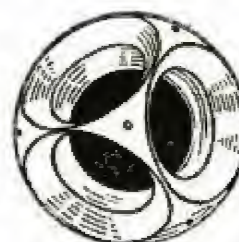
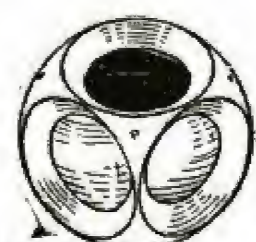


FIG. 18



A SMALL, quiet, but sorrowful, if not disgusted man sat by the side of a motor car drawn out of the road as a large touring car came along, driven by a man with an interrogatory aspect. The man in the touring car had seen that auto every time he passed that day, so he slowed up and leaned over.

"How long have you been here?"

"Several hours."

"Can't you find out what is the matter?"

"No."

"Inlet valve all right?"

"Yes."

"Trouble with the spark plug?"

"Think not."

"How are your batteries?"

"O. K."

"How's your commutator?"

"Great."

"Perhaps your worm gear is clogged."

"No, not at all."

"Got any gasoline in your tank?"

"Plenty."

"Tires seem all right?"

"Never better."

"Well, maybe your vibrator isn't adjusted."

"That's all right."

"Have you looked at your carburetor?"

"Yes."

"How about the cam shaft?"

"Grand."

"Have you tightened your connecting rod, examined your clutches and gone over the differentials?"

"Yes, yes."

The man in the touring car paused a moment and then looking at the stranger by the roadside, said at last: "What's the matter with that machine of yours?"

"There isn't anything the matter with this machine; but since noon my wife has been in the house over there kissing her sister's first baby goodbye. When she gets through if you are not more than 1,000 miles away and will leave your address, I will telegraph or cable you the glad news."

Statistically Inclined Tourist (in Wales)—What is the death rate here?

Native—Same as it is everywhere else; one death for every inhabitant.—*Brooklyn Life*.

Two negro men came up to the outskirts of a crowd where Senator Bailey was making a campaign speech. After listening to the speech for about ten minutes, one of them turned to his companion and asked:

"Who am dat man, Sambo?"

"Ah don't know what his name am," Sambo replied, "but he certainly do recommen' hisself mos' highly."

When the monitor "Puritan" was sunk in Chesapeake Bay, a high navy officer called up Secretary of the Navy Meyer, and inquired:

"Mr. Secretary, how's the 'Puritan'?"

"The 'Puritan,'" replied Mr. Meyer, "is still as good a ship as any that ever sailed the face of the earth."—*Popular Magazine*.

The conversation veered around to dogs.

"Well, Bumps, here is a dog story that can't be beat. My friend, Johnson, had a most intelligent retriever. One night Johnson's house caught fire. All was instant confusion. Old Johnson and wife flew for the children and bundled out with them in quick order. Alas! one of them had been left behind! But up jumped the dog, rushed into the house, and soon reappeared with the missing child. "Everyone was saved; but Rover dashed through the flames again. What did the dog want? No one knew. Presently the noble animal reappeared, scorched and burned, with—with what, do you think?"

"Give it up," chortled eager listeners.

"With the fire insurance policy, wrapped in a damp towel, gentlemen!"—*Firemen's Standard*.

Asker—"Don't you find that aviation is far more delicately skillful sport than motoring?"

Flyer—"Sure; I know it's far harder to hit a bird than a stout pedestrian."—*Chicago News*.

We all know the information fiend—the man who, not content with absorbing facts and figures of no account whatever, persists in airing his knowledge on every conceivable occasion.

Jerome K. Jerome, the well-known humorist, came up against one of these torments while crossing the Atlantic. He was leaning over the rail one morning, when the information fiend tapped him intimately on the shoulder.

"Sir," he said, with a grandiloquent wave of the hand in the direction of the water, "do you know that if the earth were flattened out the sea would be miles deep all around over the world?"

Mr. Jerome looked impressed. "Well," he replied, with a vestige of a smile, "if you catch any one flattening out the earth, shoot him on the spot. I can't swim."—*Tit-Bits*.

Manhattan—"The authorities of my city are talking of having a detail of airship police."

LaSalle—"My! They certainly are behind the times. My city has had fly cops for the last decade."—*Indianapolis News*.

NEW BOOKS

MOTION STUDY: A Method for Increasing the Efficiency of the Workman—By Frank B. Gilbreth. An extract from the preface explains the function of this important contribution to industrial literature: "Standardizing the trades is the world's most important work today, and motion study is the first factor in that work." 116 pages, 5x7½, cloth, illustrated, \$2.00 net. D. Van Nostrand Company, New York.

PRACTICAL APPLIED ELECTRICITY—By David Penn Moreton. A simple and practical primer on electricity, encyclopedic in scope and logical in style and order, which contains practically all that the average electrician will need for a thorough understanding of his subject. 450 pages, 4¼x7¼, flexible leather, 323 illustrations, \$2.00 net. (Workers' edition, with protecting flap, inside pocket and 16 memoranda pages, \$2.50 net.) Reilly & Britton Co., Chicago.

MATHEMATICS FOR THE PRACTICAL MAN—By George Howe. An elementary treatment of algebra, geometry, trigonometry, logarithms, analytical geometry, and calculus. 143 pages, 5x7½, cloth, illustrated, \$1.25 net. D. Van Nostrand Co., New York.

PRINCIPLES OF MACHINE WORK—By Robert H. Smith. A continuation of the "Elements of Machine Work," by the same author. Goes into lathes, grinding machines, drills, etc., in some detail, especially as regards the numerous operations which these machines are capable of doing. The illustrations, of which there are 434, call for a word of special praise. 388 pages, 5x8, cloth, illustrated, \$3.00. Industrial Education Book Company, Boston, Mass.

THE WIRELESS OPERATOR'S POCKETBOOK of Information and Diagrams—By Leon W. Bishop. A simply written work which caters directly to non-technical wireless operators and amateurs. 200 pages, 4¼x6¼, illustrated; cloth, \$1.00; leatherette, \$1.25; leather, \$1.50. Bubier Publishing Company, Lynn, Mass.

HANDWORK INSTRUCTION FOR BOYS—By Dr. Alwin Pabst. Translated from the German by Bertha Reed Coffman. An essay on the various methods of manual training in use in different places, chiefly of interest to teachers. 165 pages, 5x8, cloth, illustrated, \$1.00. The Manual Arts Press, Peoria, Illinois.

The Austin, Pa., Telephone Exchange and Post Office. Where the Young Women Operators Braved Death to Give Warning of the Flood.

Copyright by American Press Association.



BURSTING OF CONCRETE DAM DEVASTATES VALLEY

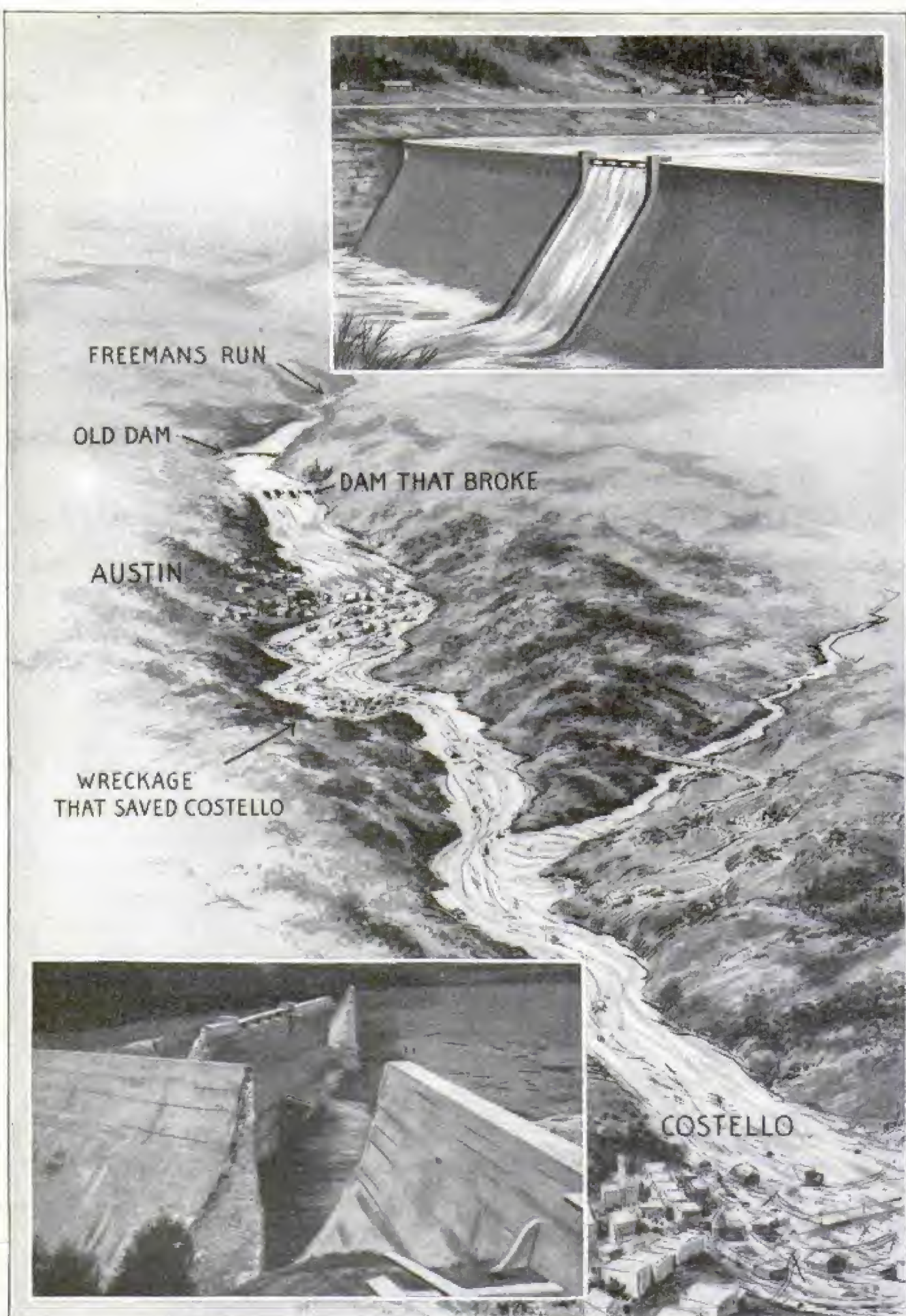
Scores of people were killed and property in two towns damaged to the extent of millions of dollars when an immense concrete dam built across Freeman's Run just north of Austin, Pa., burst Sept. 30 and 200,000,000 gal. of water swept down a narrow valley walled in by high hills. The dam was 42 ft. high and was built in 1909 nearer the town and to supplement an older dam intended to furnish power for a pulp and paper mill, which employed a majority of Austin's 3,000 population. Within five minutes after the break came the flood had struck and passed through Austin, demolishing hundreds of homes and business

blocks. The loss of life was estimated to be between 75 and 100 and the property damage \$8,000,000.

This devastation was principally due to the fact that piles of pulp wood and lumber were picked up by the water and hurled at the light frame structures, demolishing houses and stores and piling them, in turn, against the few brick and other substantial buildings. The debris then caught fire by the upsetting of stoves and the bursting of natural gas pipes. A path was swept through Austin $\frac{3}{8}$ mile wide and $1\frac{3}{4}$ miles long, including most of the business section, and the valley residence portion.



Five Minutes after the Dam Burst Only Piles of Debris and Weeping Women Marked the Sites of Hundreds of Comfortable Homes.



Bird's-Eye View of the Pretty Pennsylvania Valley in Which Austin and Costello were Located, Showing the Location of the Two Dams, the Two Towns and the Path of the Flood. Picture in Upper Corner Shows Dam as It Looked before It Burst. (Courtesy of the Engineering News.) Picture in the Lower Corner Shows the Dam after the Catastrophe.

Where the Flood Started. View of the Wrecked Dam from the Side toward the Town. Photo Copyright by Pictorial News Co.



Center of Devastation. The Paper Mill a Mass of Broken Timber, Logs and Debris. Photo Copyright by American Press Association.

Track Left by the Deluge as it Passed Out of Austin. Remains of Houses, Stores and Churches Strewn along Creek Bank. Photo Copyright by Pictorial News Co.





The Wrecks of Light Frame Buildings Were Piled against Brick and More Substantial Structures. Photo Copyright by Pictorial News Co.

In Costello, a village three miles below Austin, 50 buildings were demolished, and two people were killed. The damage in this community might have been greater but for the fact that a mass of wreckage caught in a bend of the valley and held back the flood long enough to permit the people who had been warned to flee to the hills.

The vast body of water was released when two immense sections of the dam were thrown out like the gates of a canal lock, the water sweeping the valley practically clear to bedrock.

The dam was completed in December, 1909. A leak was discovered in January, 1910. At that time a 2-ft. section of concrete along the rim was removed and a patch was made. Not-

withstanding these measures, the dam gradually became a slight arc instead of a straight line.



Houses Heaped Together Like Picture Blocks on a Nursery Floor.



Debris Piled against the Railway Station in a Heap as High as the Building.

NOTICE—The below reduced size page will be read with great interest:

FIELD FOR DRAFTSMEN

*This Page taken from *Popular Mech. Advertising Section Jan. 1910*

Big Demand for Mechanical Draftsmen. Positions Paying \$100 to \$150 Per Month

It is perhaps not known to many Readers of Popular Mechanics, but especially to the ambitious, wide awake, and progressive ones and to the large number of Mechanics reading this paper that there is no better field or opportunity for advancement than there is to the practical and well trained Mechanical Draftsman.

But not that man is wanted who has the largest or most expensive library of technical school books "at home," neither the one that carries along with him under his arm when applying for a position a nicely engraved "beautiful Diploma" on paper (costing \$50 to \$75 per sq. ft.) nor the "would be" Draftsman that can "copy" a nice looking picture from another picture with given dimensions.

No, the demand is for Draftsmen with practical Drafting Room training that can "Do Things," Do it "themselves," and Do it right away "Right."

No Employer cares for your Diploma, neither for your set of nice "Books at Home" in your Book-case. He wants you to "Deliver the Goods" for the money he pays. To Draw \$100—\$150 per month, the average Salary paid to Draftsmen, you must be able to do more than "Only make a Copy" of someone else's drawing. Originality and practical ability is demanded of you and this requires practical training.

The quickest and best way to be trained on practical Drafting Room work and to get the required practical experience is to receive personal and individual Instruction from a High

Grade practical man at the trade, with a reputation as the most experienced man in training men to become **COMPETENT and SUCCESSFUL DRAFTSMEN.**

An ordinary Draftsman, not even the best Draftsman can teach this trade unless he has many years of experience as an Instructor, and has ability to impart knowledge that is understood and that will stick forever. A special gift that 99 out of 100 do not have.

Mr. P. Dobe, Chief Draftsman of the Engineers Equipment Co. (inc.) Chicago, with 20 years experience in training and handling men has for a good many years given personal individual Instruction by mail with the most deserving success, because his Instruction work consists of actual practical Drafting Room work that gives his personal student and apprentice the required practical experience.

He treats each student personally and gives him individual practical working instruction according to the ability of the student to master the work and to advance. His instruction is not given as patent medicine the same for all alike, and his personal assistance is very valuable to anyone.

Mr. Dobe has been an advertiser in this paper for a good many years and will send his "Successful Draftsmanship" Prospectus, 6x9, also list of 250 open Draftsmen positions and full information free. Anyone earnestly interested should write to him personally, his advertisement appears on last page of this book.

Read it over again Every Word true

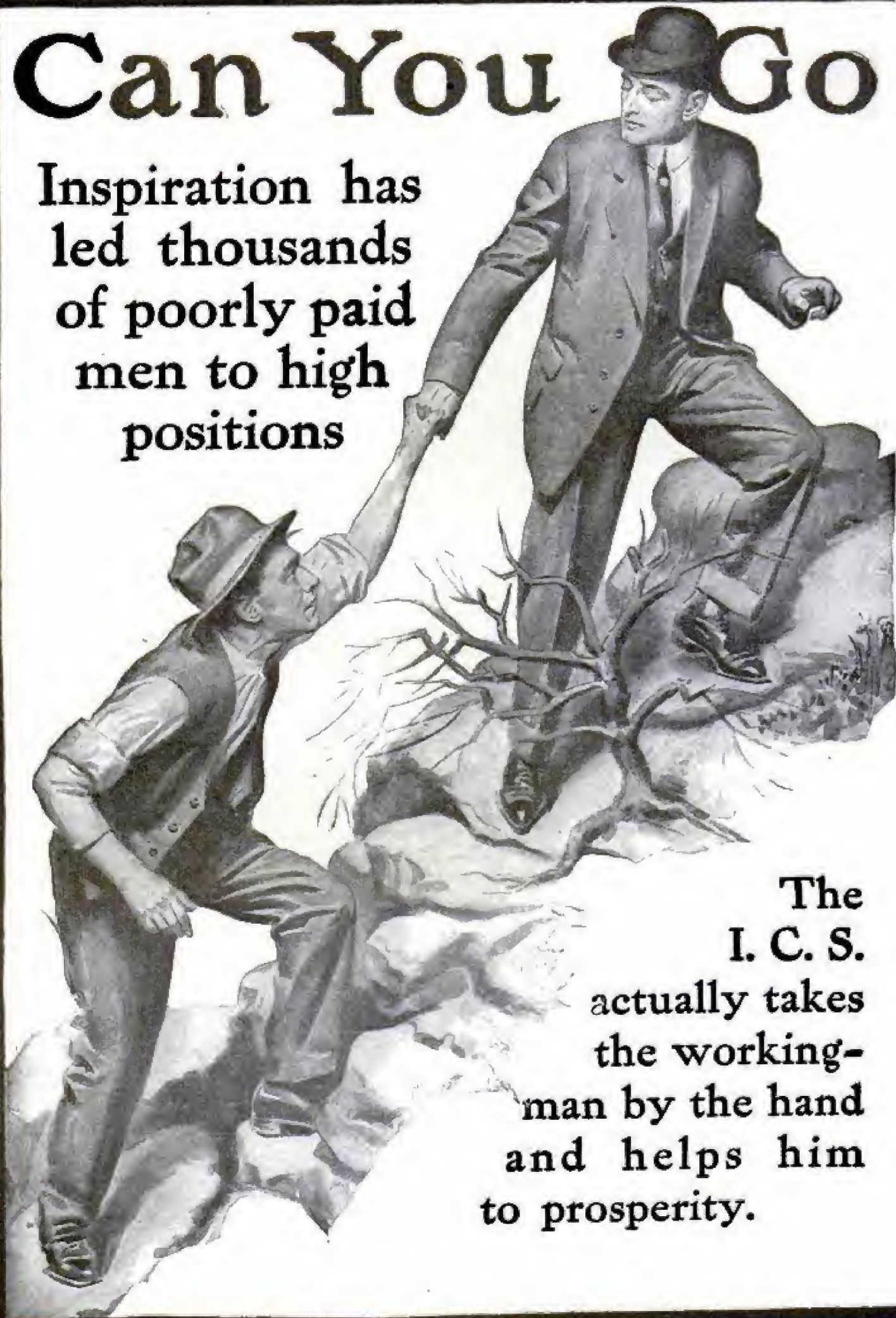
NOTICE—I accept for Instruction only a limited number of desirable and success-promising students, and not, like schools do, anybody and everybody that can pay the price.

Read my advertisement on last page

Read my advertisement on last page

Can You Go

Inspiration has
led thousands
of poorly paid
men to high
positions



The
I. C. S.
actually takes
the working-
man by the hand
and helps him
to prosperity.

Where Others Go ?



THE only difficult part of GOING UP is in making up your mind to START.

After that, the road is smooth, and the higher you go, the easier it becomes.

You may be working under such circumstances that advance seems impossible, but YOU CAN GO UP. You may now have a fairly good position, but you can go still higher. Just follow the example set by thousands of I. C. S. students who have made good and are making good. Every month an average of over 400 students of the International Correspondence Schools voluntarily report an increase in their earnings.

Think of a man who a short time ago was earning but \$10 a week and is now earning five times that amount. Think of a day laborer being qualified as a superintendent by I. C. S. training.

These are not exceptional cases. There are thousands and thousands of them. The I. C. S. will tell you who they are and where they are.

Architects, Engineers, Electricians, Designers, Draughtsmen, Inventors, have been and are students of the I. C. S. Large employers of labor regard I. C. S. training as proof of ability.

Such educational institutions as Yale, Harvard, Princeton, Cornell and the University of Pennsylvania cannot do for the working man what the I. C. S. can do. With all this evidence, do you doubt its power to help you ?

If you do, here is an offer to prove it. Mark and mail the coupon at once, and the I. C. S. will send you more evidence. If you are not perfectly satisfied you are under no obligations to proceed further.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 872, SCRANTON, PA.

Explain, without further obligation on my part, how I can qualify for the position before which I mark X.

Automobile Running
Mine Superintendent
Mine Foreman
Plumbing, Steam Fitting
Concrete Construction
Civil Engineer
Textile Manufacturing
Stationary Engineer
Telephone Expert
Mechan. Engineer
Mechanical Draftsman
Electrical Engineer
Elec. Lighting Supt.

Civil Service
Architect
Chemist
Languages—
Building Contractor
Architectural Draftsman
Industrial Designing
Commercial Illustrating
Window Trimming
Show Card Writing
Advertising Man
Stenographer
Bookkeeper

Spanish
French
German
Italian

Name _____

Present Occupation _____

Street and No. _____

City _____ State _____



In the Bell Democracy

Membership in the telephone democracy of the Bell System means equal opportunity for every man, no matter who he is or where he is.

Each member of this Bell democracy has the same chance of communication, limited only by the distance the voice can be carried.

However remote, whether in the adobe house on the Rio Grande, on the Montana sheep ranch or in the isolated New England farm house, the Bell telephone is an open doorway to the Universal Bell System.

From each Bell outpost run lines that connect it with the central office—that nerve center of the local system.

Long distance and toll lines connect these nerve centers and furnish clear tracks for telephone talk throughout the land.

12,000,000 miles of wire are the highways over which 20,000,000 telephone talks are carried daily.

The Bell System binds together the social and business activities of a people in a shoulder-to-shoulder march of progress.

**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

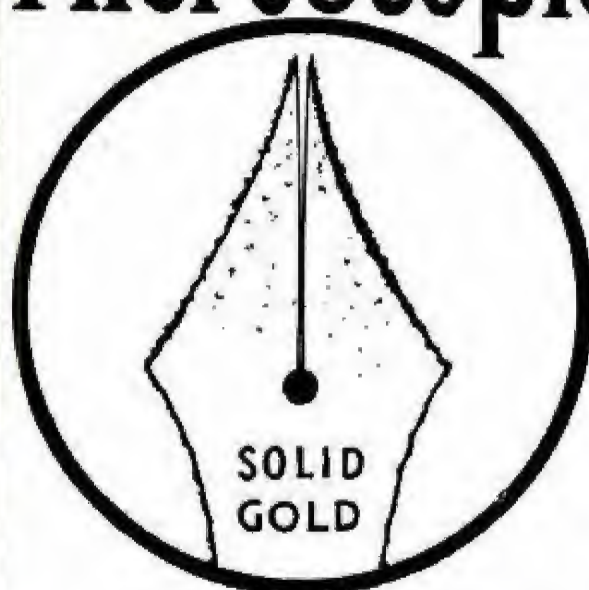
One Policy

One System

Universal Service

Waterman's IDEAL

Fountain Pen Stands *the* Test of Microscopic Examination



These are truthful pictures offered for the thoughtful consideration of pen users.

Under a modern, high-power lens, the difference between highly-skilled, hand-made pens and those of the "made-to-sell-cheaply" order is very apparent.

Notice the rough edges, the badly finished writing point, poor "set," all of which causes users to wonder why their pens do not write smoothly and readily.

Avoid Substitutes.

L. E. Waterman Co.



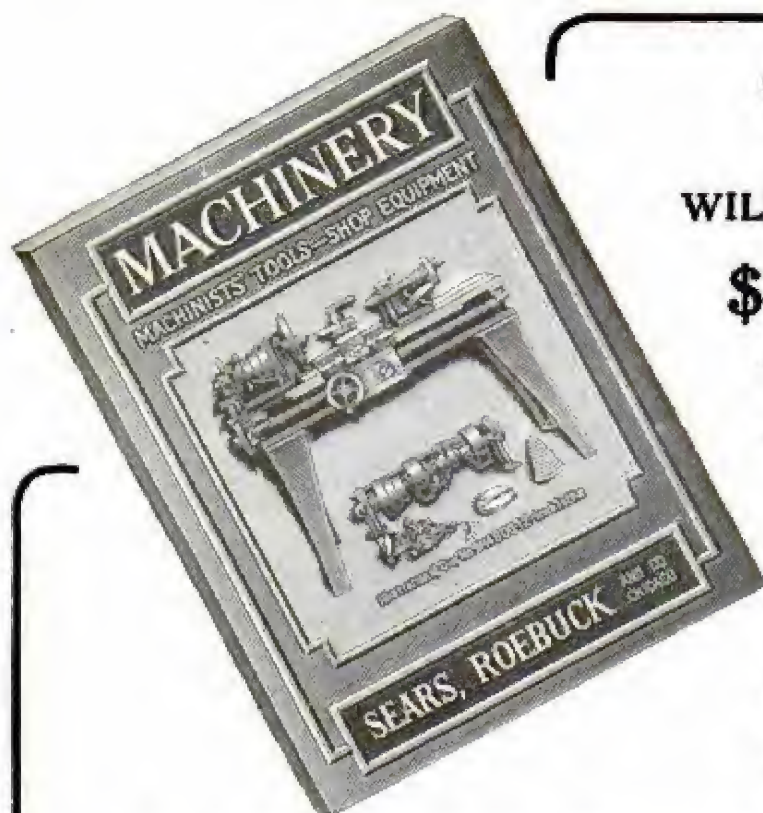
This reproduces the finish of the pen point used in all Waterman's Ideals.

Under closest scrutiny the utmost nicety of finish and workmanship is revealed. It is the same quality pen point on the \$2.50 pen and the pen made for expensive presents.

Notice the absolutely true edges and the perfect grinding of the hard iridium writing point.

The stamp Waterman's Ideal is a guarantee of extreme superiority of finish and quality.
Sold Everywhere.

173 Broadway, N. Y.



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*Every Blacksmith, Garage Man or
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to buy the best machinery at the lowest
possible prices.*

Our Lathes are practical in design, accurate and strong, unexcelled in workmanship, and, size for size, considerably heavier than other makes that will compare with ours in general design. They are made to satisfy and we guarantee them.

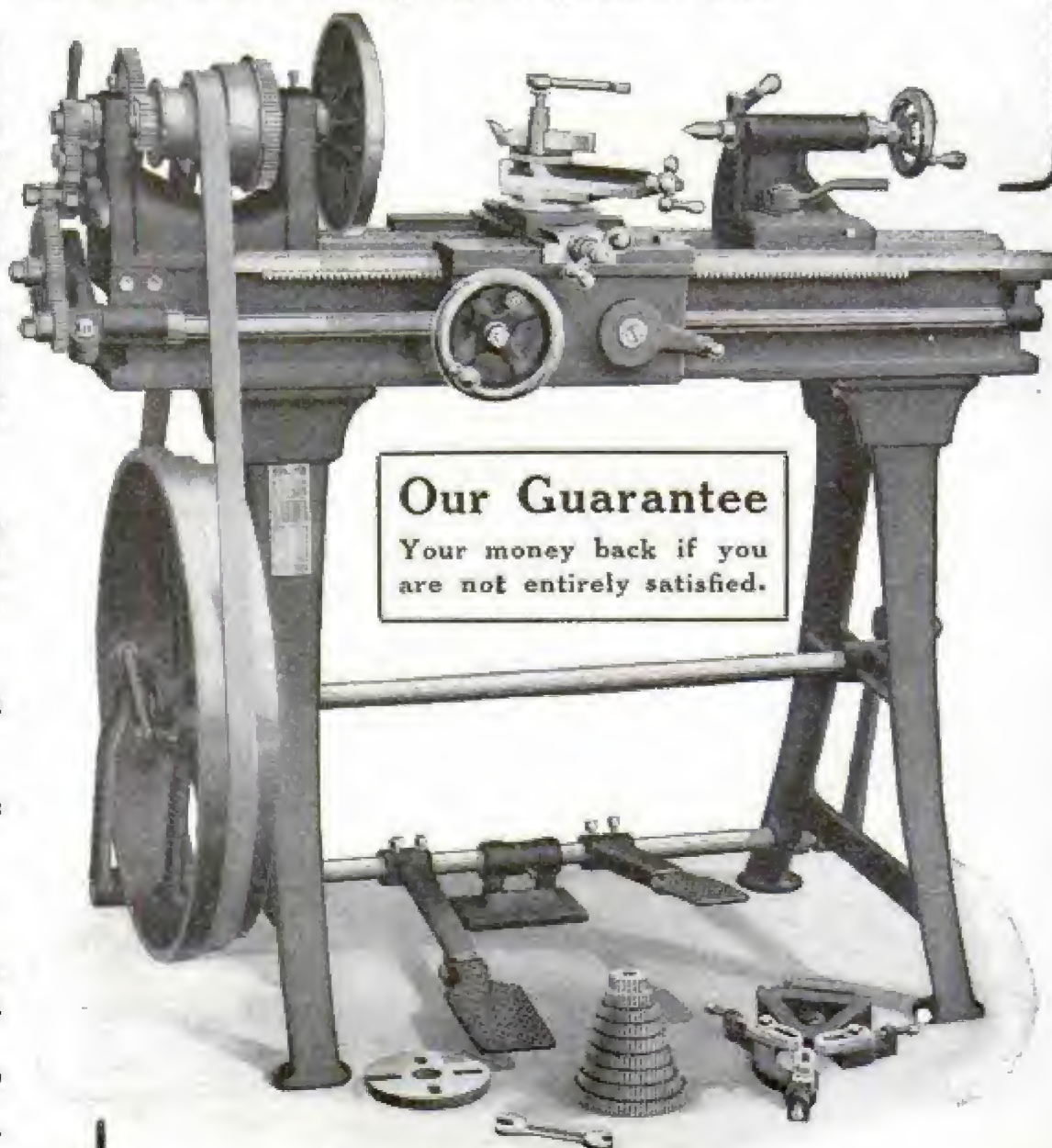
Have you a lathe in your shop? If not, get our Machinery Catalog before you buy. Compare our prices with those of other Machinery Catalogs and judge for yourself; you will then understand why we have sold hundreds of lathes and not one has yet failed to give satisfaction.

Buy one of our lathes and add one more to our list of satisfied customers.

Prices range from
\$60.00 up.

Address

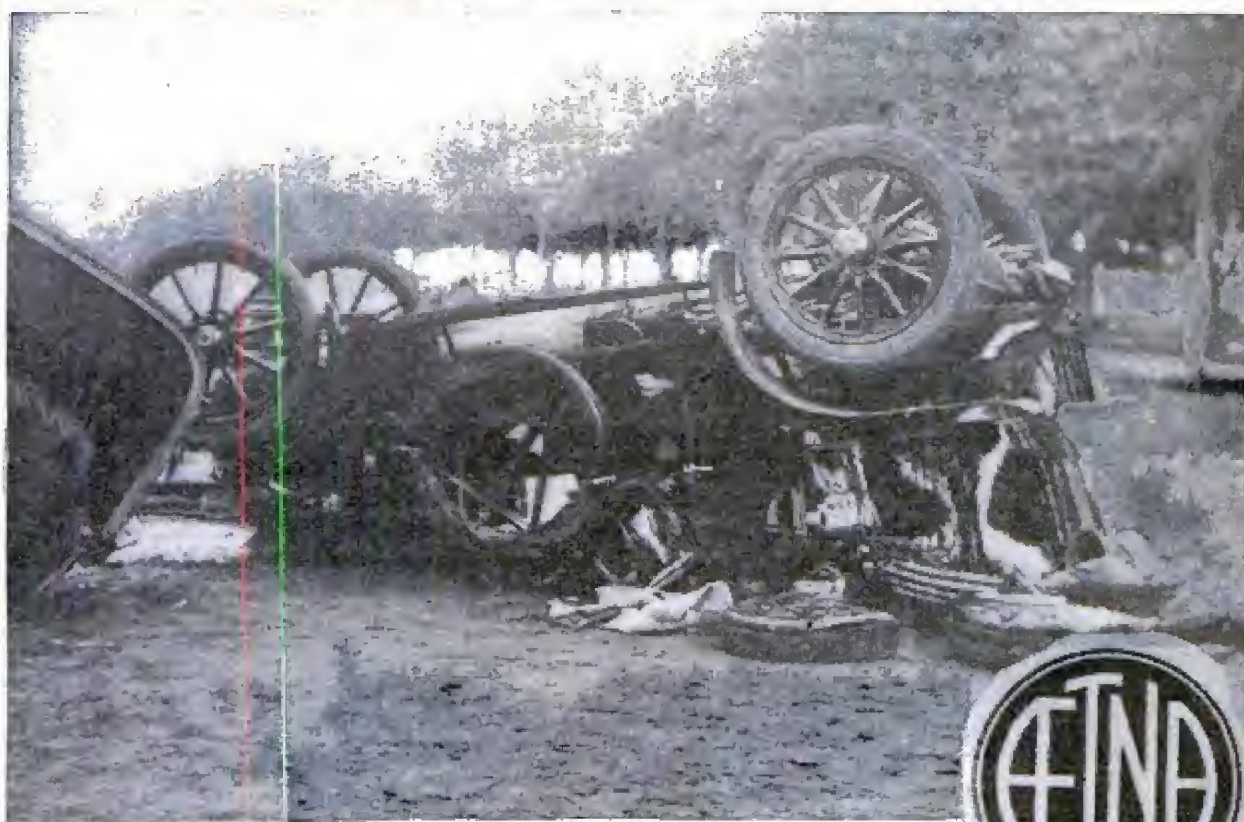
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ROEBUCK
AND CO.,
CHICAGO, ILL.**



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Your money back if you
are not entirely satisfied.

ÆTNA-IZED?



WHY NOT BE ÆTNA-IZED WITH A TEN DOLLAR BILL

Ten Dollars will insure you for one year under the famous

ÆTNA Ten Dollar Combination

In the extent and variety of protection this policy gives, it is without a rival. For \$10 a year this policy pays

\$2,250.00 for death from travel or burning building accident

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It also pays liberally for loss of limb or sight, and provides weekly indemnity for accidental injury that results in total or partial disability

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ACCIDENT AND LIABILITY DEPARTMENT

HARTFORD, CONN.

Send me information about your \$10 COMBINATION

Name _____

Address _____

2c a Week Pays Wash Bill!

Electricity or Water-Power Does the Work

Write for
FREE Book

Just a "Twist of the Wrist" Starts or Stops the Machine!

The 1900 Motor Washers are now at work in thousands of homes. They are doing the work formerly done by women, at a cost of 2c a week for power! Saving thousands upon thousands of dollars in wash bills. Saving worlds of wash-day troubles. Leaving the women free to do other work while the machines are doing the washing.

The 1900 Motor Washer

1900 Water Motor Washer
Can be connected with
any water tap instantly



Washes a Tubful in Six Minutes!

Handles Heavy Blankets or Dainty Laces

The outfit consists of the famous 1900 Washer with either Electric Motor or Water Motor. You turn on the power as easily as you turn on the light, and back and forth goes the tub, washing the clothes for dear life. Then, turn a lever, and the washer does the wringing. All so simple and easy that it is mere child's play.

A Self-Working Wringer Free With Every Washer!

The motor runs Washer and Wringer. We guarantee the perfect working of both. No extra charge for Wringer, which is one of the finest made. Write for FREE BOOK and 30 Days' FREE TRIAL OFFER! Don't doubt! Don't say it can't be done. The free book proves that it can. But we do not ask you to take our word for it. We offer to send a 1900 Motor Washer on absolute Free Trial for an entire month to any responsible person. Not a cent of security—nor a promise to buy. Just your word that you will give it a test. We even agree to pay the freight, and will take it back if it fails to do all we claim for it. A postal card with your name and address sent to us today will bring you the book free by return mail. All correspondence should be addressed to 1900 WASHER CO., 5026 Court St., Binghamton, N. Y. Or, if you live in Canada, Write to the Canadian Washer Co., 555 Yonge St., Toronto, Canada. (23)



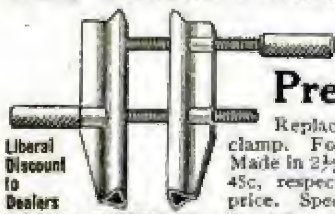
Doing the wringing with
1900 Electric Motor Washer

MR. HANDY-MAN'S WORK-BENCH

IS NOT COMPLETE WITHOUT

PARKER'S

Pressed Metal Clamp



Liberal
Discount
to
Dealers

Replaces the antiquated, cumbersome, wood clamp. For mechanics, machinists, wood-workers. Made in 2 1/4 in., 3 in., 3 1/2 in. sizes. Prices, 25c, 35c, 45c, respectively. Mailed post-paid on receipt of price. Special reduction when ordered in quantities.

JOHN L. PARKER CO., Metal Stampings, 62 Jackson St., WORCESTER, MASS.

NICKELITE

The new synthetic substance for nickel plating metals. It is an electro-plate. NICKELITE is applied to the metal by hand with a wet rag. The process is electrolytic, but no apparatus of any kind is required. Price, 25 cents per box. Supplied by your dealer or will be sent postpaid direct from the manufacturer upon receipt of price. GORMAN MANUFACTURING COMPANY, HAZLETON, PA.

STINGING WEAPONS OF WAR—Probably the most remarkable weapons of war ever used on the field of battle were swarms of bees. There are at least two well authenticated instances of the use of this novel and stinging weapon. The first is related by Appian of the siege of Themisecyra, in Pontus, by Lucullus, in his war against Mithridates. Turrets were brought up, mounds were built, and huge mines were made by the Romans. The people of Themisecyra dug into these mines from above, and through the holes cast down upon the workmen bears and other wild animals, together with swarms of bees. The second instance occurred in England. The Danes and Norwegians were attacking Chester, held by the Saxons and some Gallic auxiliaries. After using stones and boiling water in vain against the besiegers, the Saxons threw down all the beehives in the town upon the attackers, who were soon routed.—Philadelphia Inquirer.

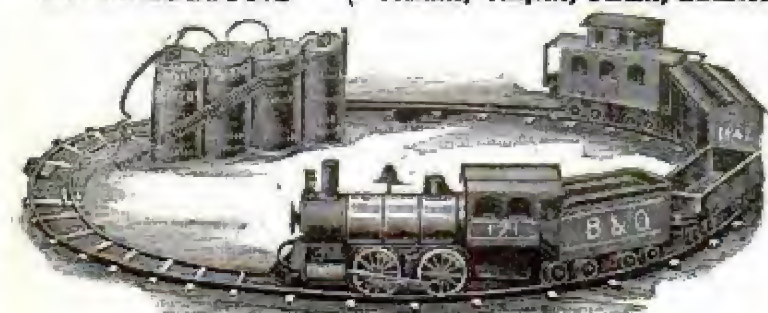


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EVERY boy in the country can easily own a railroad. Costs little and pays big dividends in fun. Our Models of Locomotives, Trains, Trolley Cars, Dynamos, Lamps, etc. are practicable and durable inventions. Equipped with dry batteries, no acids or liquids used, perfectly safe and harmless. Electrical toys instruct as well as amuse.

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GROW MUSHROOMS



Join the Army of Money Makers. Be Independent

Its as Easy as A-B-C to Add \$5 to \$60 a Week to Your Income

This is the opportunity you have been looking for. I have shown over 1000 readers of Popular Mechanics last month how to increase their income. **Here are the facts** that should appeal to you.

- 1** You can grow mushrooms anywhere. In your barn, shed, or any outbuilding. One of the best places in the world is your basement. A mushroom bed in your basement is not offensive.
- 2** Mushroom growing does not take any time from your present occupation, as they require almost no care at all.
- 3** Success is certain with my method and the demand will always be far in excess of the supply. Mushrooms are selling today for \$1.00 to \$1.50 a pound.
- 4** Almost no "capital" is required. Many successful growers have started with \$2 worth of spawn.
- 5** My instructions are so plain and easy to follow that anyone who can read English is sure of success.

Women Succeed in Mushroom Business as well as Men

Mrs. Mary Bonar, Ohio, writes: "I know a woman can raise mushrooms successfully, for I have tried it and succeeded." Mrs. Guillaume, Wis., says: "Can sell all I have at 80 cents per pound." Boys find a sure enough "gold mine" in mushrooms. Herbert Fickenworth, 12 years old, Chicago, writes: "I am picking and selling mushrooms every day." Webster Jones, aged 14 years, Little Rock, Ark., says: "Any boy who is willing to follow directions can learn to grow mushrooms." "Growing mushrooms is just the kind of work a boy likes, and I know I can make more money out of it than anything else."

How Some Bank Accounts are Growing

Just read these extracts from letters such as I am receiving every day:

I have a customer in California who started a few years ago with a few small beds, and this year is putting \$10,000 in the business.

Another customer in Massachusetts also started in a very small way and this year is putting in \$60,000. (Names upon request.)

My youngest grower is 10 years old and he is meeting with splendid success. I have any number of letters from people who started with an investment of \$2 and find that they can easily net from \$50 to \$60 on the one bed.

Every State Agricultural School in the United States has my book of instructions as a reference book. One of the biggest crops that I ever heard of has been grown at one of the Experimental Stations by my method of growing and with my spawn.

Two of my customers in Arlington Heights, Ill., in the basements of their homes last year, invested \$75 in the mushroom business and raised \$680 worth of mushrooms, leaving a clear profit of \$605 on an investment of \$75.

I Will Tell You the Facts About This Business

The fact that you have read these statements and have learned a few facts concerning the money making possibilities of mushroom growing, will never benefit you one penny's worth if you don't take advantage of the chance it affords you, and GET POSTED.

I am the largest grower in America and have had 14 years' experience. I have put the facts about this great business into a book which I call, "How to Make Money in Mushrooms." Now the first thing for you to do is to either write, or send the coupon for this book. **IT IS FREE.** And when I send the book I will also give you very complete information as to the best way for you to start, the cost, etc., etc. Then you can think it over and make up your mind. But send for the book anyhow. **DO THAT MUCH TODAY.**

Address _____

Jackson Mushroom Farm

6259 N. Western Ave., CHICAGO, ILL.

NAME.....

ADDRESS.....

TOWN.....

STATE.....

P.M.

A. V.

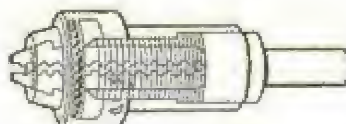
Jackson,

Jackson Mushroom Farm

6259 N. Western Ave. Chicago, Ill.

Please mail me your book "HOW TO MAKE MONEY IN MUSHROOMS," and also give me full information as to the best way to start, cost, etc. All this to be entirely without cost or obligation on my part.

TEAR OFF THIS COUPON AND MAIL TO-DAY



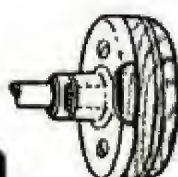
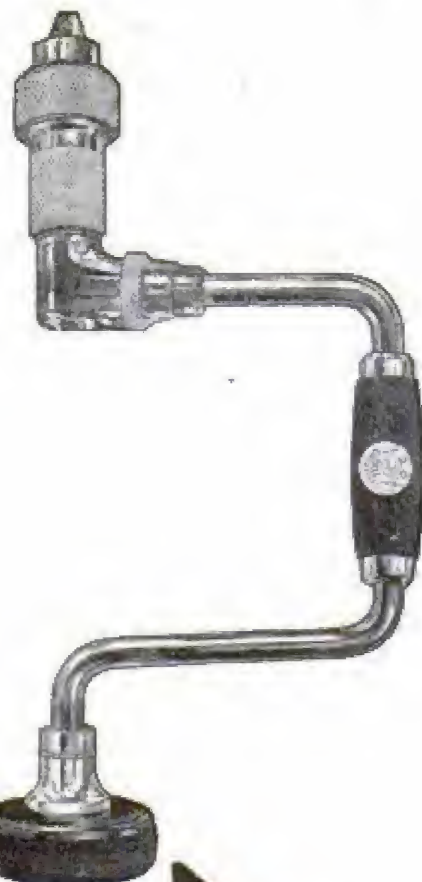
The Ball-bearing Chuck is found only on the P. S. & W. SAMSON BRACE. It can be tightened with the bare hand to a firmer grip than any other chuck with a vise. The weakest wrist can release it.

The Steel-clad Head with dust-proof ball-bearings is another strong feature of the SAMSON.



REG. U.S.

PAT. OFF.



It pays to buy good tools

When you buy a brace, you ought to know how it is made and who made it. The large line of high-grade P.S.&W. Braces is backed by the Trade-mark that stands for quality and nearly a century of business ability, experience and progress. Look for

**The MARK of the MAKER on every
P. S. & W. SAMSON BRACE**

It's one of the top-notchers among hundreds of P. S. & W. Guaranteed Tools for Carpenters, Machinists, Electricians, Tinsmiths, etc.

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FOURTH EDITION NOW READY FOR DISTRIBUTION

Our "Mechanics' Handy List," shown at the left, contains over 35 pages of tables and valuable information, and a catalog of over 200 tools for Carpenters, Machinists, Electricians and Tinsmiths.

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MANUF'RS of the Largest Line of Mechanics' Hand Tools Offered by Any Maker

Address Correspondence to 20 Murray St.

NEW YORK CITY

Established
1819

Five Large
Factories



New Rapid Tool Grinder Great Time and Work Saver

THIS tool sharpening outfit lowers your expense, saves tools, time and money, and increases production. You can prove it by 30 days' free trial.

The Hummer is all metal with bevel gear drive like an automobile—the most indestructible grinding machine ever built—and the fastest. Power can be applied, but it runs 4000 revolutions per minute by foot power as easy as a bicycle down grade. The most difficult job of grinding is the work of

only a few minutes, and with the tool rests and special attachments your apprentice can do it as well as a master mechanic.



Luther Hummer Tool Grinder

The new Luther Hummer is mechanically perfect. The angle iron frame is strong and rigid; ball-bearing, shaft and bevel gears are enclosed in dust-proof housing and run in oil bath.

The Hummer can be converted into a drill, turning lathe, jig or rip-saw, has flexible shaft attachments, etc. Saves money in more different ways than any tool in your shop. Will not draw temper—no water cooling necessary.

Dimo Grit Wheels — 7 Wheels for Steel

The wonderful, new artificial diamond abrasive is the most suitable for all steel grinding. Cuts hardest steel as emery does copper—25 times faster cutting than the grindstone—6 times more efficient than emery wheels. No need of cooling with water—no danger of drawing temper. Carborundum wheels furnished if desired.

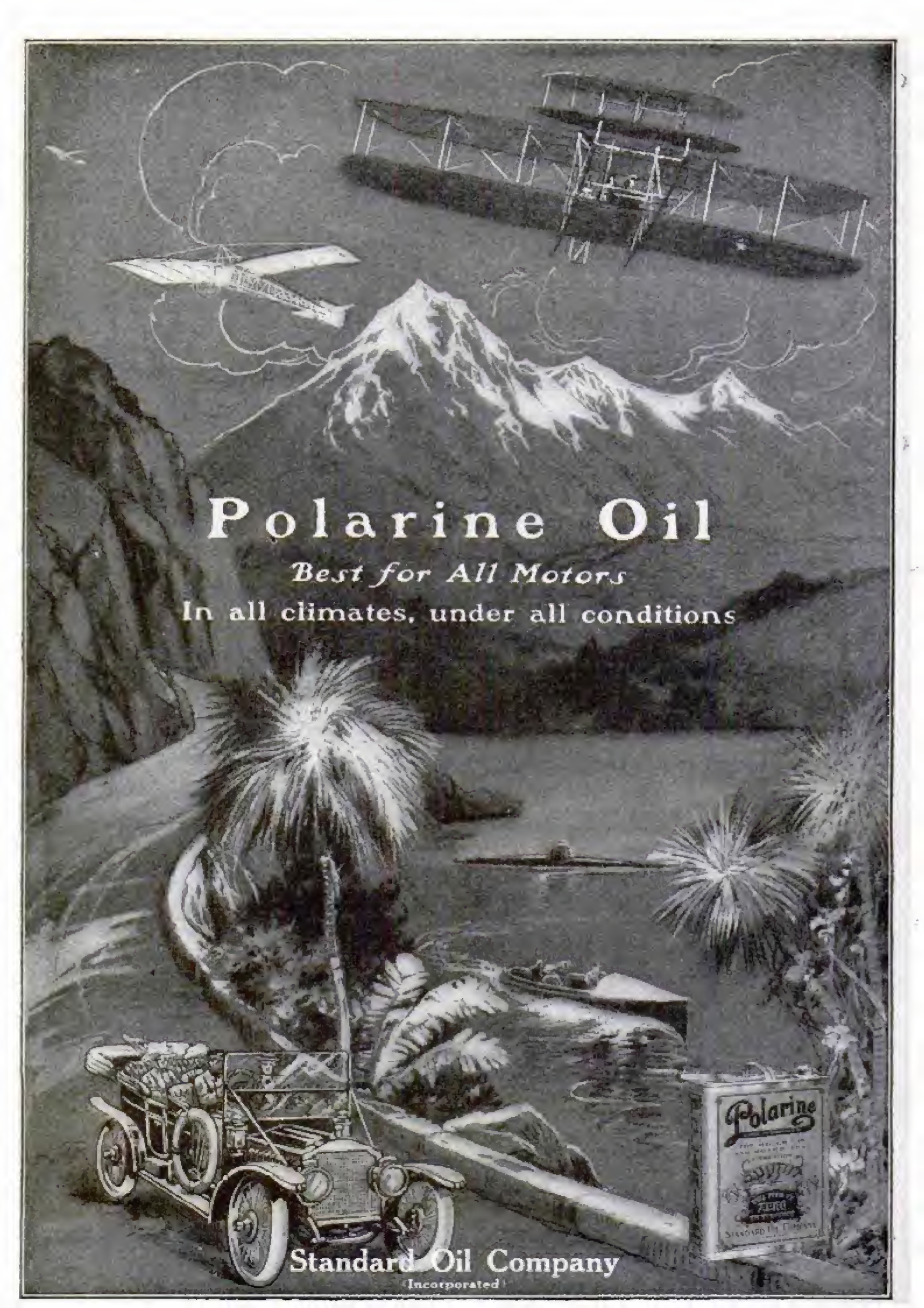
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Printype is distinguished by marvelous clearness and beauty. It does away with all strain on eyesight which the old-style *outline* type imposes. Printype puts life and style and *character* into typewritten correspondence. It makes every letter, every numeral, every character "*as plain as print.*"

The complete story of *Printype* has never before been told. Here it is:

The Real Story of Printype

The idea from which "*Printype*" sprung resulted from the success of our type experts in equipping a typewriter used in our offices to

write "*The Oliver Typewriter*" in our famous trade-mark type just as the name appears on the outside of the machines and in all Oliver publicity.

The beautiful appearance and the marvelous clearness of the reproduction of our "*ebony*" trade-mark type, disclosed the possibilities of equipping The Oliver Typewriter to *write the entire English language in shaded letters!*

We worked for *years* on the plan and finally succeeded in producing, for exclusive use on The Oliver Typewriter, the wonderful shaded letters and numerals known to the world as "*Printype.*"

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Already over 75 per cent of our entire output of Oliver Typewriters are "Printypes."

The public is *demanding* *Printype* in preference to the old-style type.

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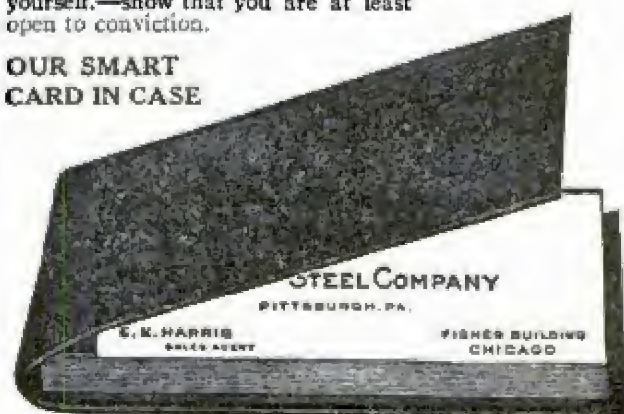
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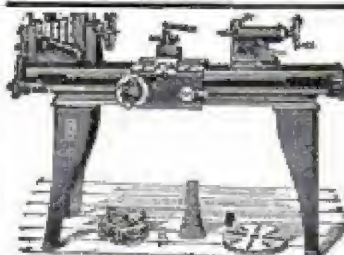
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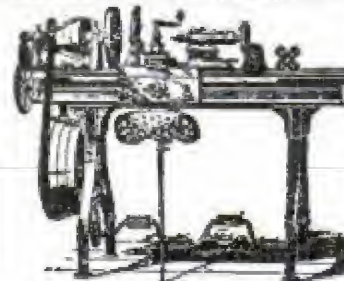


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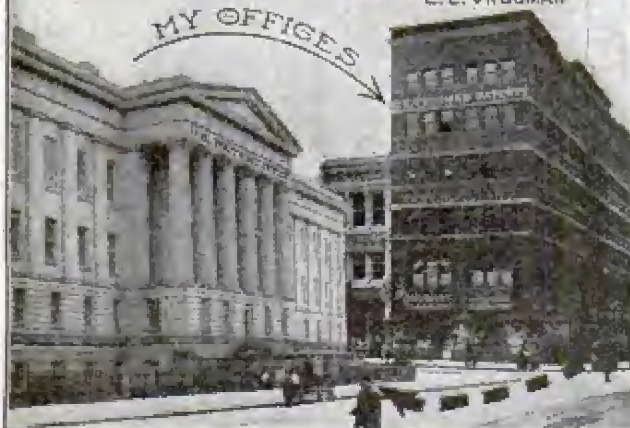
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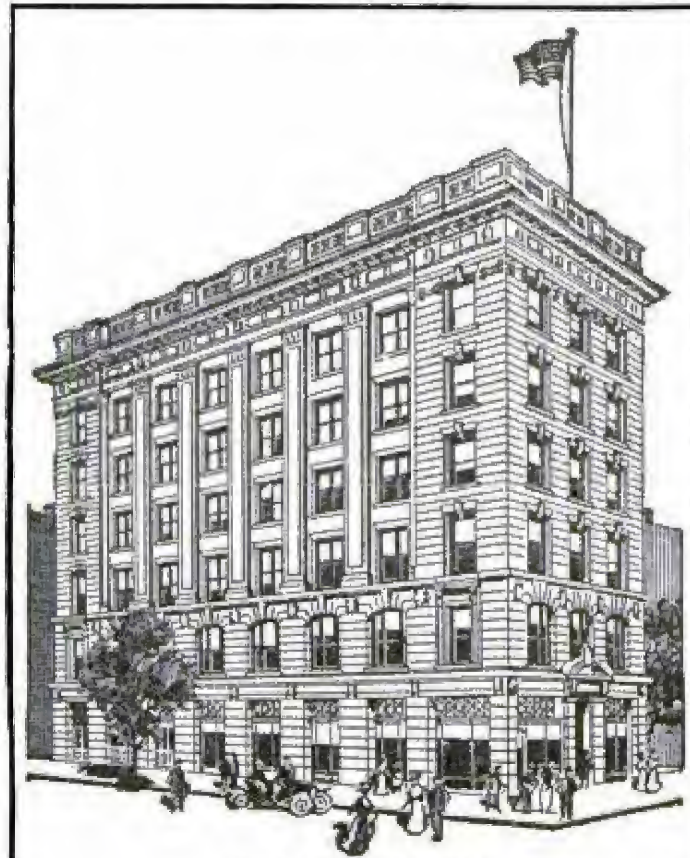
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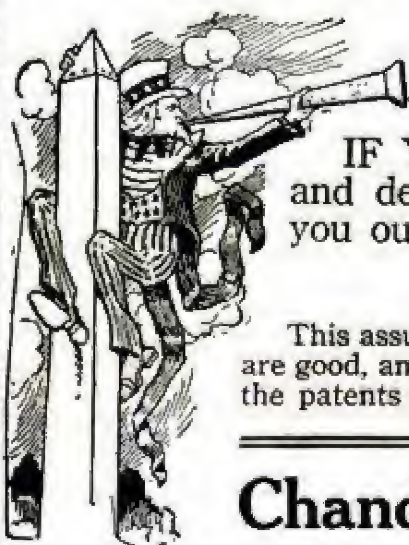
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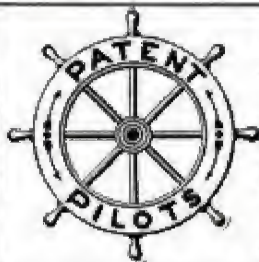
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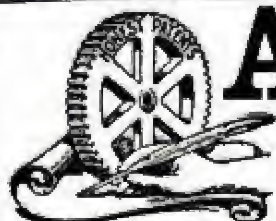
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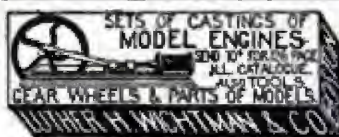
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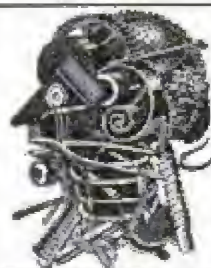
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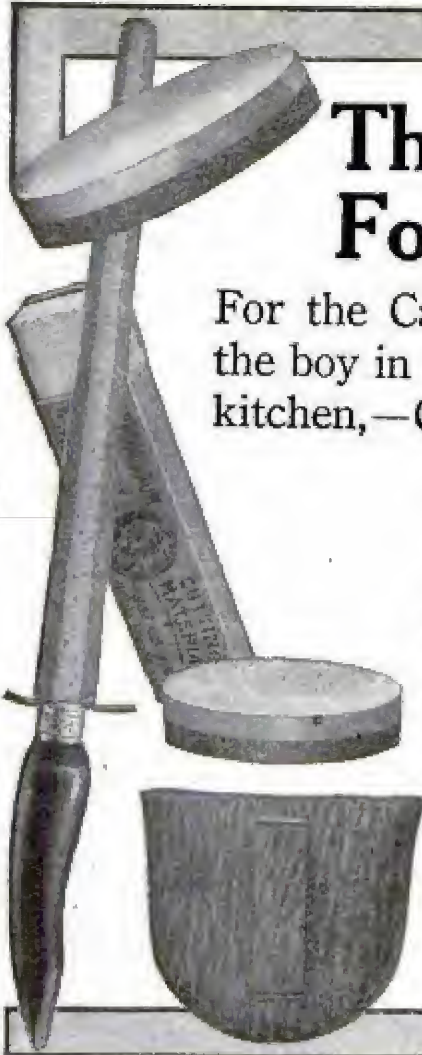
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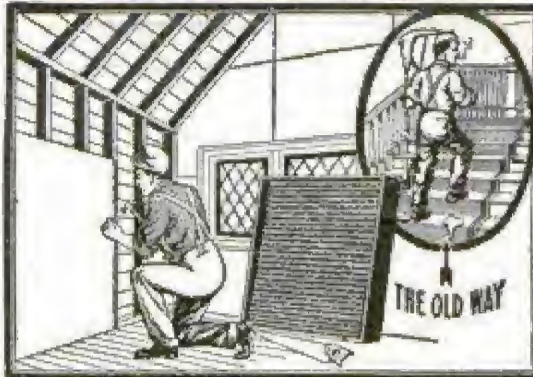
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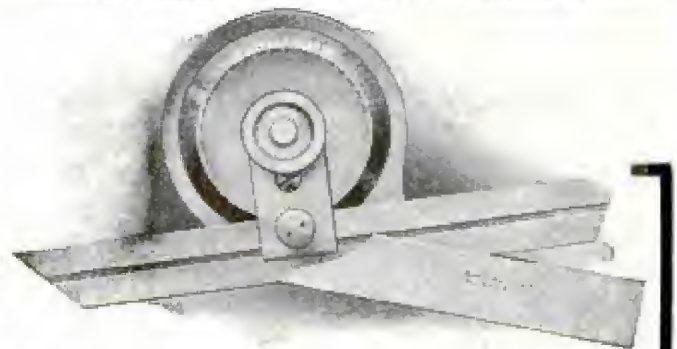
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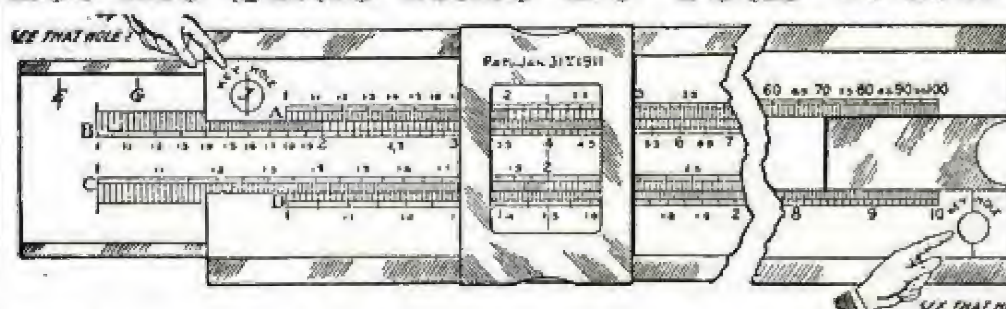
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RIDER AGENTS WANTED

In each town to ride and exhibit sample 1912 model. Write for Special Offer. Finest

Guaranteed 1912 Models \$10 to \$27

with Coaster-Brakes and Puncture-Proof Tires.

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ALL OF BEST MAKES.....

100 Second-Hand Wheels

All makes and models, good as new

Great Factory Clearing Sale. \$3 to \$8

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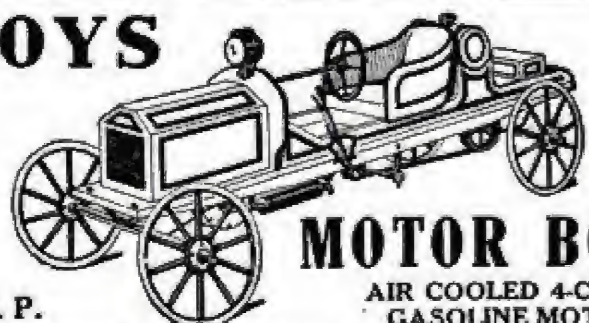
TIRES coaster-brake wheels, lamps, and

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BUY till you get our catalogue and offer. Write now.

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**AIR COOLED 4-CYCLE
GASOLINE MOTOR**

A PRACTICAL MINIATURE AUTO propelled by a small gasoline motor. The greatest instructive, mechanical device ever invented. Boys all over the world now building Motor Bobs. Any boy of 12 years and up can build and operate the Motor Bob. Send 25 cents (coin preferred) for our complete instruction booklet, "HOW TO BUILD A MOTOR BOB," which contains simple drawings, diagrams, pictures, instructions for building and operating, and list of parts.

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THE FLYING MERKEL

"The World's Most Comfortable Motorcycle"

The only motorcycle with a Spring Frame and Spring Fork—a unique feature that reduces bumping, jolting and vibration to a minimum. For reliability and power, you can't beat "The Flying Merkel's" ball-bearing engine. For business or for pleasure, "The Flying Merkel" is the ideal motorcycle for economy and dependability.

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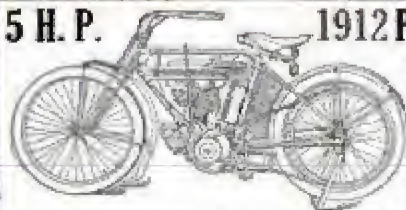
MAKE A MOTORCYCLE OF YOUR BIKE



at small cost, by using our attachable outfit. It fits any bicycle. Motorcycles, all makes, new and second hand \$35.00 up. Send stamp for catalogue and bargain list. Keller's new 104-page booklet, "Construction, Management and Care of Motorcycles" is now ready. Price, postpaid, 25c.

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5 H. P. 1912 Peerless Motorcycle



With Free Engine Idler and Bosch Magneto together with the best there is in motorcycle construction—Power, Silence, Endurance, and those Wearing Qualities so essential for low cost of maintenance.
5 MILES FOR ONE CENT
Agents Wanted—Liberal Discounts

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WHY TAKE CHANCES
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Covered by a Year's Guarantee?
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—that deliver a "fat" spark every time without skip or miss — plugs that give the maximum power with minimum fuel consumption — plugs that will not foul or soot — are the kind of plugs every motorist wants.



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meet all the above requirements. Put them on your car and eliminate all spark troubles. If your dealer cannot supply you order direct.

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A Dollar Made Every 5 Minutes

Experience Unnecessary. "Sold out before Breakfast; 6 sales in 30 minutes," writes Hoffman, N. H. "Have 50 sold. Sell in every house," writes Cook, Mich. "Sells on sight. Women all buy. Never had such a cinch," writes McIntyre, Canada, who orders 1—then 100. Melanson, Kans, closes first day with 20 sales. (Profit \$27.60.) Hundreds men and women actually making a week's wages every day—really banking money, getting independent, buying homes, automobiles. New invention makes it easy for them—should do same for you. Tremendous sale of the

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DRIES FLOORS
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Home Comfort Scrubbing and Floor-Drying Machine

breaks all records. New, popular, irresistible—double your money every sale. Every housewife an eager customer. Really world's greatest labor-saving invention. Read the splendid news! No more back-breaking scrubbing and floor-cleaning days. New marvelous machine displaces hands, old-style brushes, unsanitary rags and hands-disfiguring mops. Vibration does the work. Scrubs, dries floors, cleans, brightens—removes dirt, grease, stains, germs—works like magic. A God-send to women. See the 3 big features! Self-feeding. Self-drying. Self-sudsing. Turns scrubbing and floor-cleaning drudgery into neat, easy, quick, pleasant task. Child of 12 can do it the Home Comfort way. Weighs 5 pounds. Sells for \$2.75—lasts for years. Not sold in stores. Well named Home Comfort. Truly a never-ending household boon. Pleases, astonishes all. Customers wonder how they ever enjoyed life without it. Mrs. Fedder, Va., writes: "Home Comfort has been a God-send. It's so easy to scrub and clean. Really wonderful how quick it works." Mrs. A. Johnson,

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Days'
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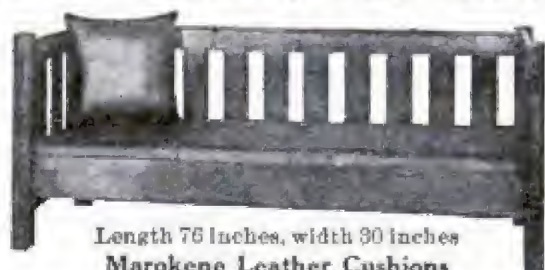


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Length 75 inches, width 30 inches

Marokene Leather Cushions

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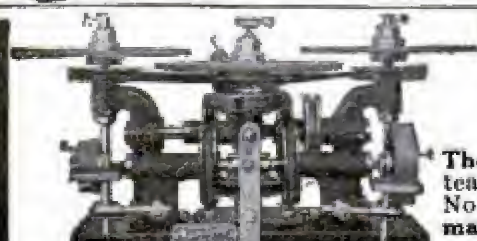
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WHEN YOU WANT LIGHT
JUST PULL THE CHAIN

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LIGHTS WITH A MATCH
AS CONVENIENT AS CITY GAS

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A beautiful lamp for homes, hotels, offices, stores, banks, cafes. Portable, safe; can be turned upside down or rolled on the floor without danger or affecting the light. 300 c.p. of soft, brilliant light, 1/2¢ per hour. Also 200 different styles of lamps and systems.

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BEACON LAMP BURNER FREE

Incandescent. 100 Candle Power. Burns common coal oil. Gives better light than gas, electricity or six ordinary lamps at one-sixth one-tenth the cost. Fits your old lamp. Unequaled for fine sewing or reading.

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BURNS KEROSENE (COAL OIL)

Outshines city gas or electricity. Simple, noiseless, odorless, clean, safe, money-saving. Guaranteed. Write nearest office for catalogue M and learn how to get an Aladdin Mantle Lamp FREE.

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By All Odds the most satisfactory lighting systems made are the

Yale "Arcolight" Pipe System
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Easy to install, easy to operate and approved by all insurance underwriters. Lights instantly. For stores, churches, homes. Gives a soft, brilliant light. 10 times that of electricity at 1/4 the cost. Sold strictly on Merit and shipped complete ready to set up. Guaranteed 2 Years.

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Full
Spring
Seat and
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\$3.85

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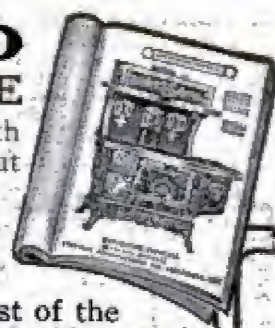
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KALAMAZOO, MICHIGAN**

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photograph fish in their natural surroundings, he had constructed a pond with an observation chamber let in at the side below the surface of the water. Through the window of this chamber, unseen by the fish, he could watch and photograph their movements. He discovered by this means that the protection of fish when in their natural state is much more thorough than is generally supposed.

All silvery fish were in reality mere mirrors in the water, reflecting the tone and color of their surround-

HOT WATER AND STEAM HEATING PLANTS

We are manufacturers and can save you money. Write for our catalogue and prices. We make complete plans and help you in every way possible.

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We will deliver a complete heating equipment at your station at factory prices and wait for our pay while you test it during 60 days of winter weather.

The entire outfit must satisfy you or you pay nothing. Isn't this worth looking into? Could we offer such liberal terms if we didn't know that the Hess Furnace excels in service, simplicity, efficiency, economy?

We are makers—not dealers—and will save you all middlemen's profits. No room for more details here. Write today for free 48-page booklet which tells all about it.

Your name and address on a post card is sufficient.

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No. 48
"Leader" Hess
Steel Furnace
Price **\$49**
Delivered East of Omaha and
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Pipes and Registers Extra



YOU can unpack and assemble ready to use all the above furniture in one evening.

The Reason back of these sensational prices is our original system of manufacturing in sections and shipping direct to you knocked down in a compact box.

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The oldest and largest firm of its kind in the world.

ings so as to appear to their fellow fish gray, unsubstantial, swimming ghosts, hardly to be distinguished at all. It was only when the dace, for example, rose to the surface, causing its body to reflect light, that the pike at the bottom of the pond could see and go for its little victim.—London Globe.

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AGENTS WANTED

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As it rolls across the room it sucks up a strong blast of air through the carpet, bringing every particle of dust out of the texture without taking up the carpet. What is more it has such a strong suction that it actually pulls the dust off **THE FLOOR** up through the carpet. Think of it.



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Just Run the Easy Running

Domestic VACUUM CLEANER

over them every day or so and your carpets are as fresh and clean as new every day in the year and the colors are always bright and fresh.

\$16

Sent anywhere in the United States, charges prepaid upon receipt of



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Domestic Vacuum Sweeper Company

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Colonial HARD WOOD Floors

are of best, standard quality Oak and Satin Walnut, steam kiln dried to prevent shrinking and accurately milled. Used over old floors or in new buildings, they add tone to any property and dollars to its selling or renting value. Simple, sanitary and ornamental. Colonial Hardwood Floors represent the least cost of re-furnishing rooms, and beautiful rugs cannot be properly displayed without them.

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Installation simple and maintenance economical. Old floors or other woodwork need not be removed. An ordinary carpenter or anyone handy with tools can do the work. Suitable designs for irregularly shaped rooms furnished free.

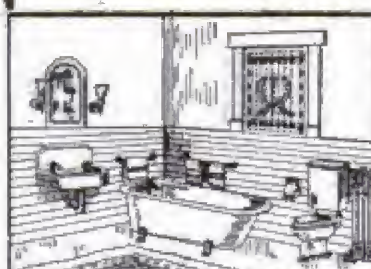
Materials sold FREIGHT PREPAID; safe delivery guaranteed; money refunded if not satisfactory.

Write today for free samples of material and descriptive booklet, all sent prepaid.

THE COLONIAL HARDWOOD FLOOR CO.
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\$42 will put running water in your home

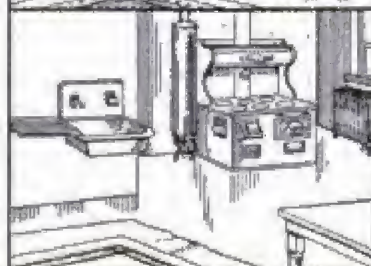
This system will supply running water for the laundry, kitchen, bathroom, garden and stables.



Made in all sizes, from \$42 up, and operated by hand power, electric motors or gasoline engines.

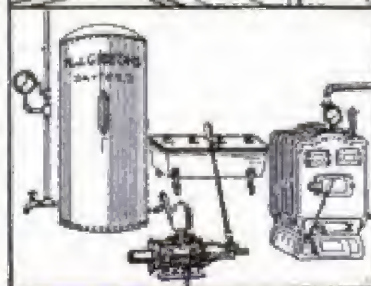
\$38.95 buys this complete bathroom outfit

The luxuries of modern plumbing at half the ordinary cost.



Save \$100 to \$250 on your steam and hot water heating plants.

Do away with the danger and trouble of oil and coal stoves. Enjoy the comforts of steam and hot water heating.



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Complete Electric Lighting Plant, \$300. Gasoline Engines for general utility farm use. Hydraulic rams, Pumps, Pipe, Valves, Fittings, at lowest prices. Farmers' Tanks, Gas and Electric Fixtures. All high-grade strictly guaranteed goods. Plans free. Get our prices. We will save you money.

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Our monthly installment plan of selling direct saves you the dealer's profit and his excessive charges for installation and repairs. You can save at least 1/3 the cost of your furnace. We have been building Jahant Furnaces for over 30 years and guarantee satisfaction.

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THE BEST HEATING SYSTEM MADE for residences, schools, hotels, churches, etc. It is the most economical furnace too and saves 1/4 to 1/2 the cost of fuel because the patented "Down-Draft System" burns wood, hard or soft coal, and burns it ALL without cinders, clinkers or any waste. Needs less attention, yet heats much better than any other furnace, hot air, steam or hot water heating system. Our plan of monthly payments

ONLY \$10 DOWN and \$10 A MONTH

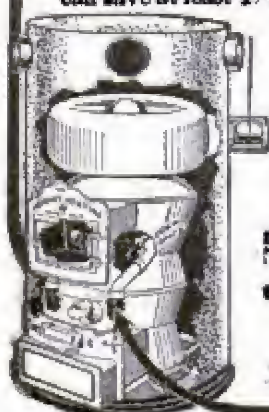
makes it easy for any one to have the best heating system made. Every Jahant Furnace is sold with a strong "Guaranty Bond" that allows you 365 DAYS TRIAL. You don't run any risk buying from us. We send complete outfit, furnace, pipes, registers, etc., together with special plans, full directions and all tools for installing. If you can drive a nail you can install a Jahant Furnace without the aid of a tinner.

Write To-Day for Catalog

which explains the Jahant Down-Draft System and tells why it gives more heat at less cost.

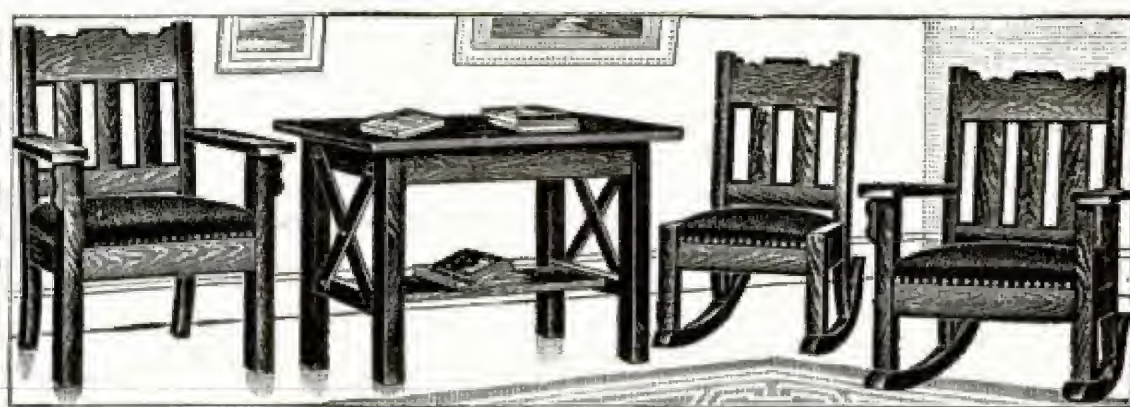
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\$1.50

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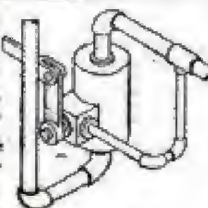
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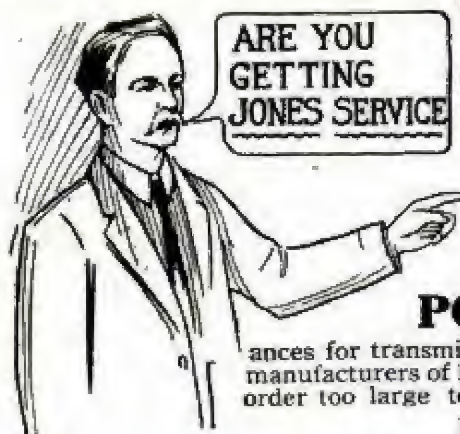
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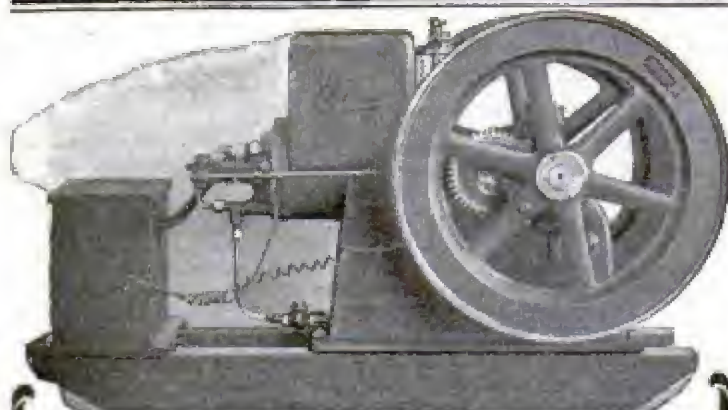
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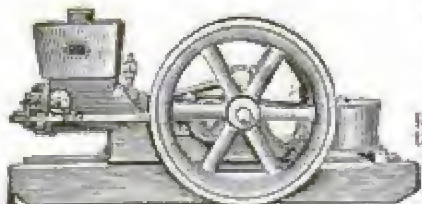
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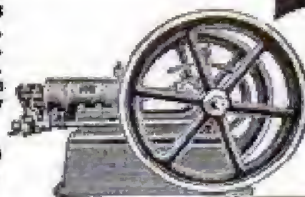
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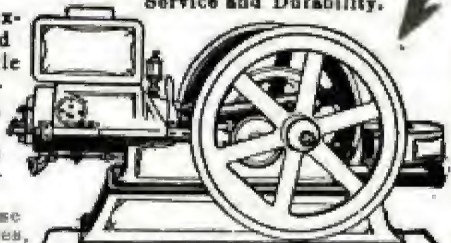
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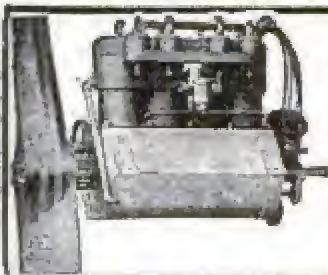
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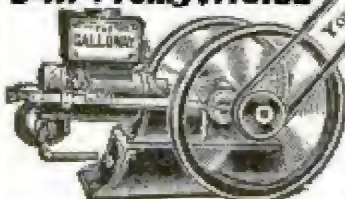
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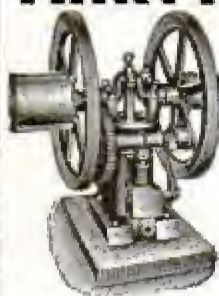
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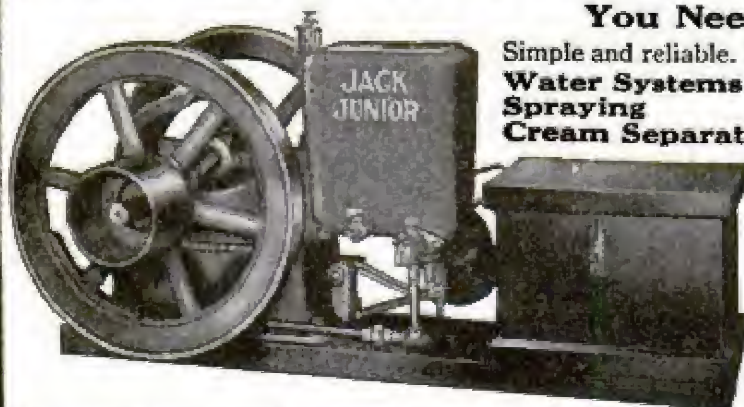
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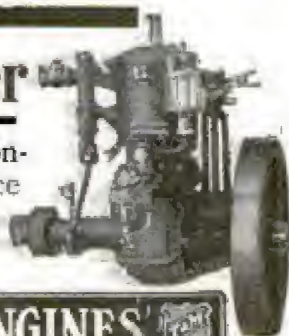
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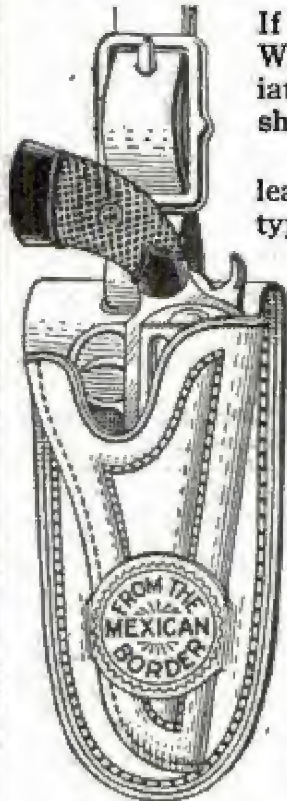
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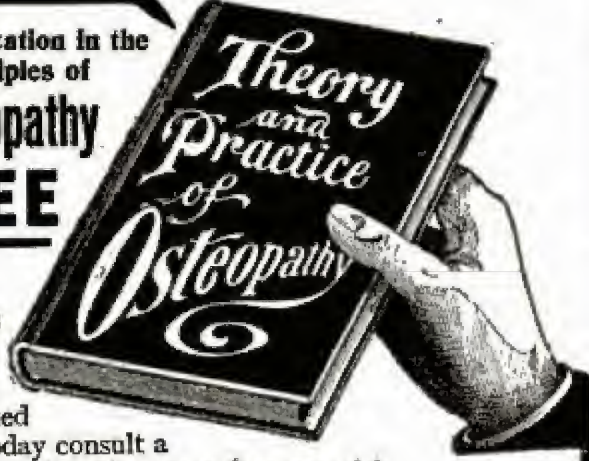
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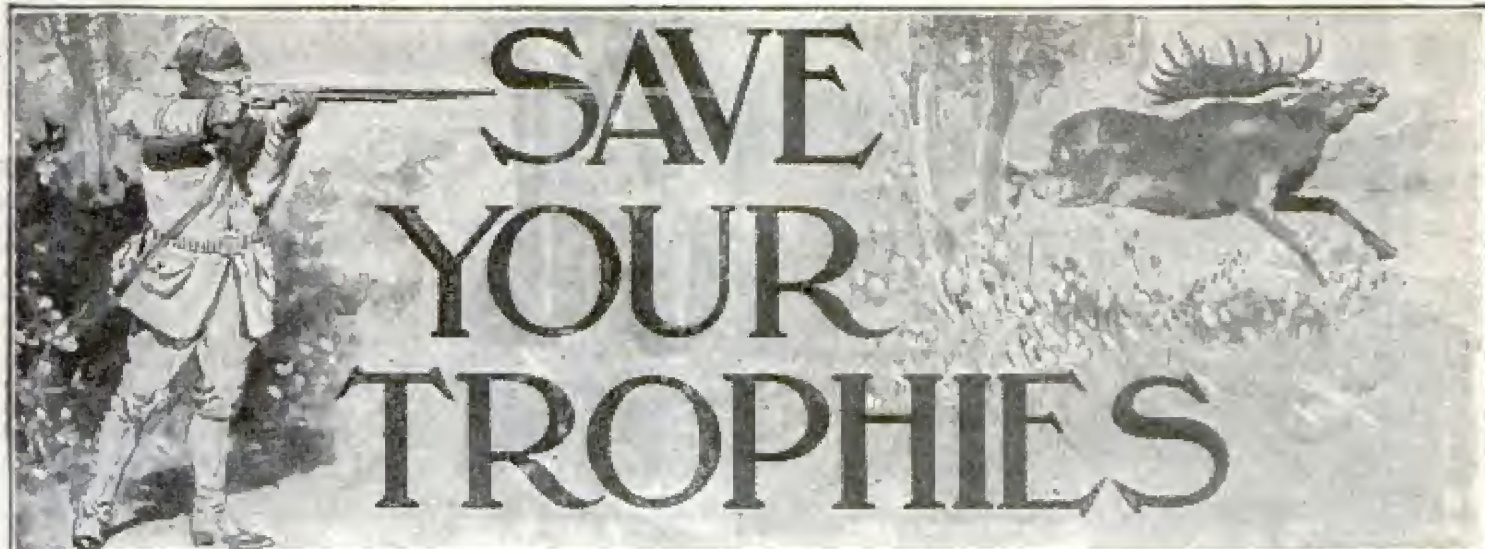
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"Meccano," the most absorbing and instructive toy ever invented, enables boys to make working models of bridges, traveling cranes, trucks, windmills, turntables and many other things. Every boy should have it. "Meccano" consists of all the main mechanical parts used in machines—levers, beams, wheels, axles, pulleys, wormwheels, screws, bolts, etc.—made of nickel steel and brass. Models can be taken down and parts used over again to make other models. Boys never grow tired of "Meccano." It keeps them interested indefinitely. Sold by leading toy and sporting goods dealers. Write for illustrated catalogue P.

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This camera makes two style photos (sizes 3x4½ and 2x3) direct on the post cards without the use of negatives. "Complete portable photo gallery." Camera weighs 6 pounds. No dark room required—pictures made in broad daylight and finished on the spot in one minute. Price of Camera \$17.50.

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church. In throwing out a spadeful of the virgin mould under this mound it split up and broke on the board and a large bee (known as the 'bumble' bee) came out of the soil. Considering that the ground above was solid, loamy clay and 6½ ft. deep, it would be impossible for a bee to get down this depth. Is it possible, therefore, that this insect was covered up in 1836?"—London Express.



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WE start you in a permanent business with us and furnish everything. We have new, easy selling plans and seasonable leaders in the Mail Order line to keep factories busy. No canvassing: Small Capital; Large profits: Spare time only required: Personal assistance. Write today for plans, positive proof and sworn statements.

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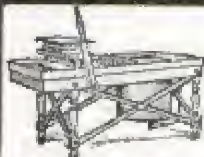
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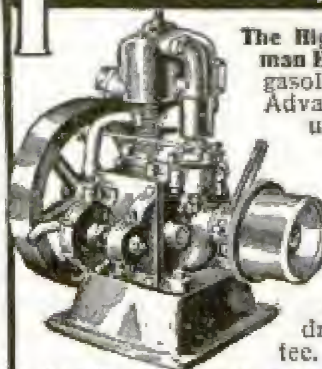
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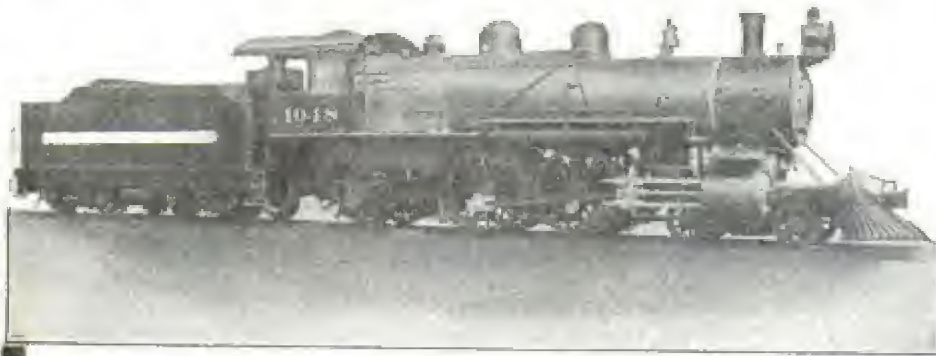
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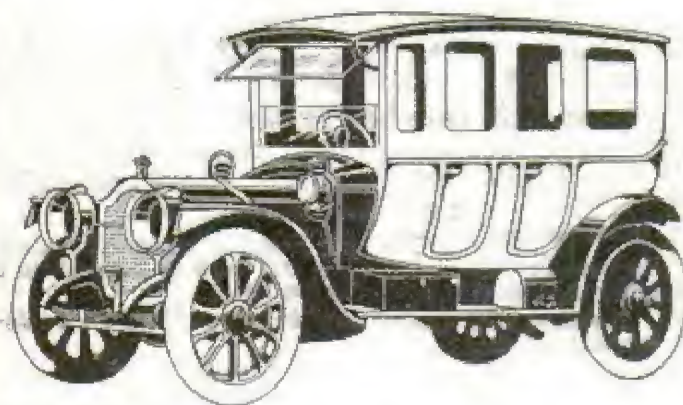
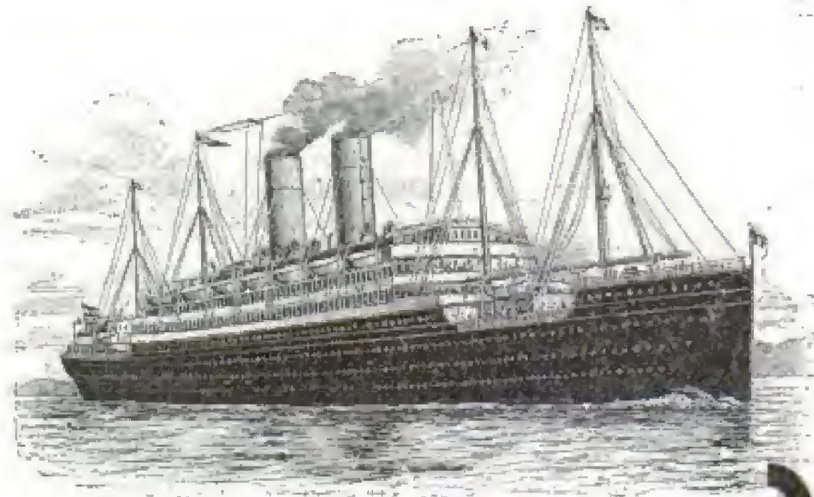
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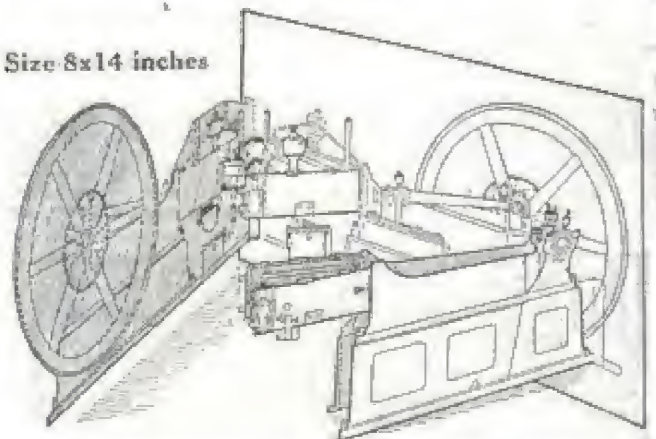


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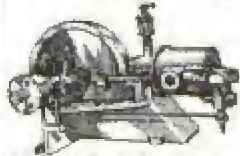


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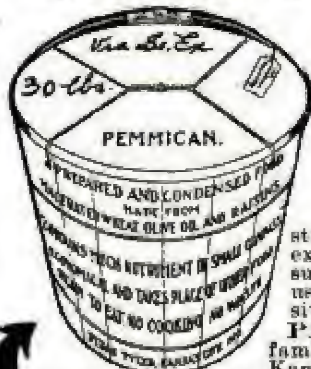
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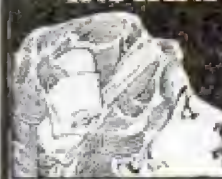
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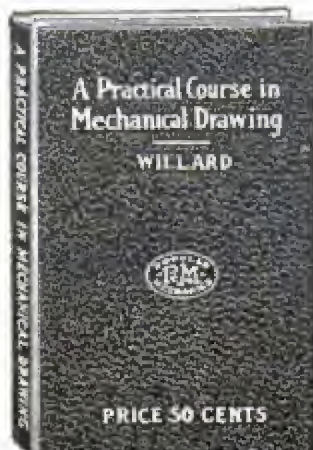
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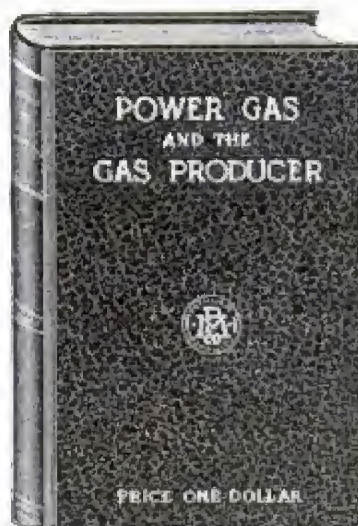
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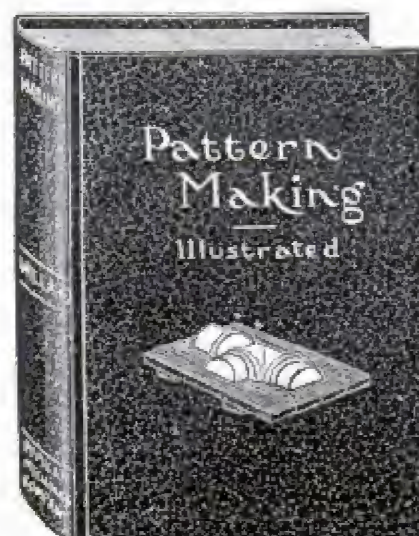
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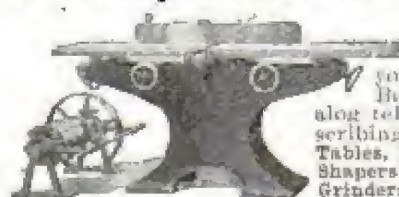
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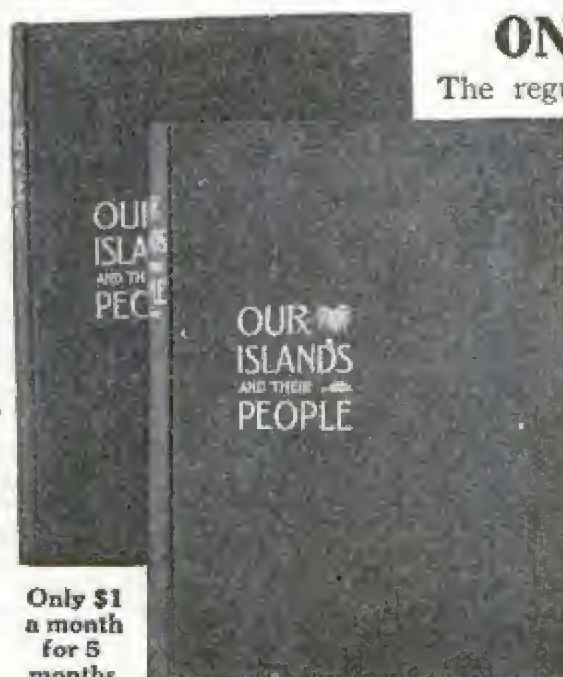
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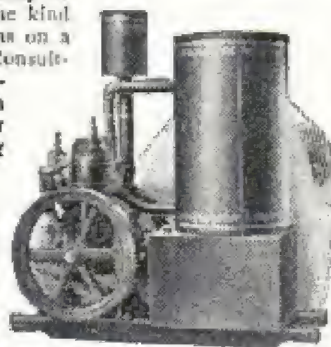
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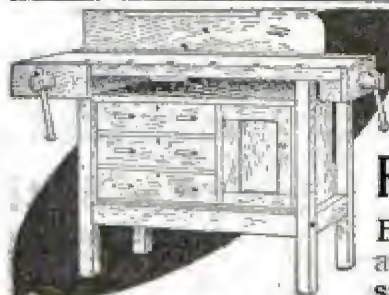
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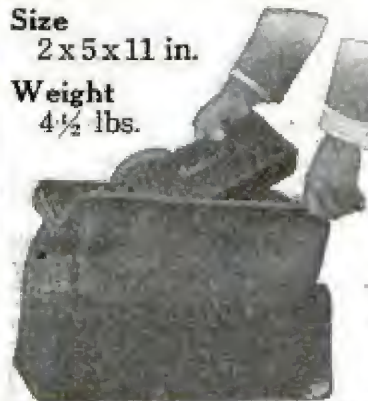
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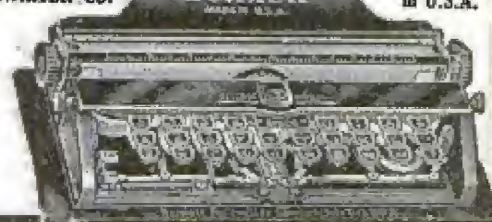
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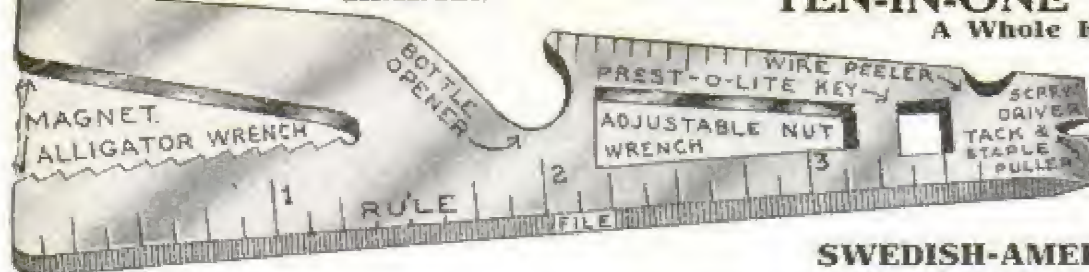
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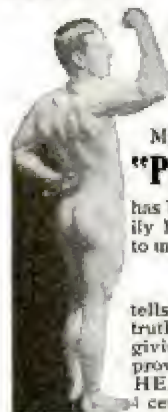


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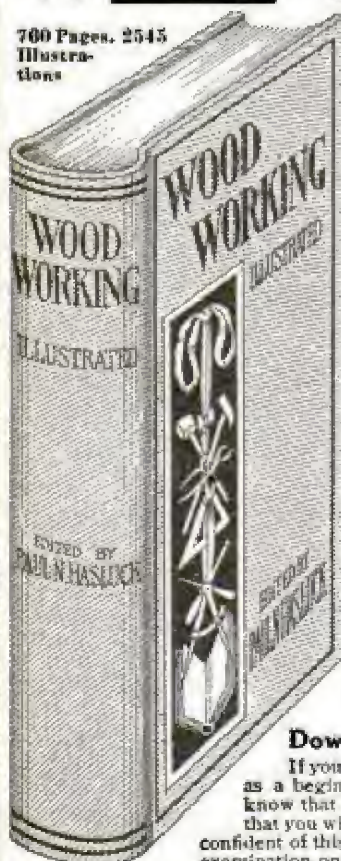
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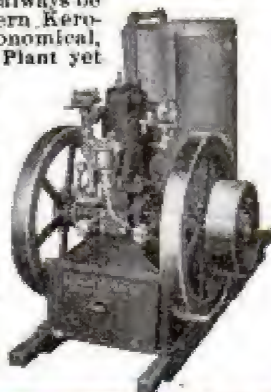
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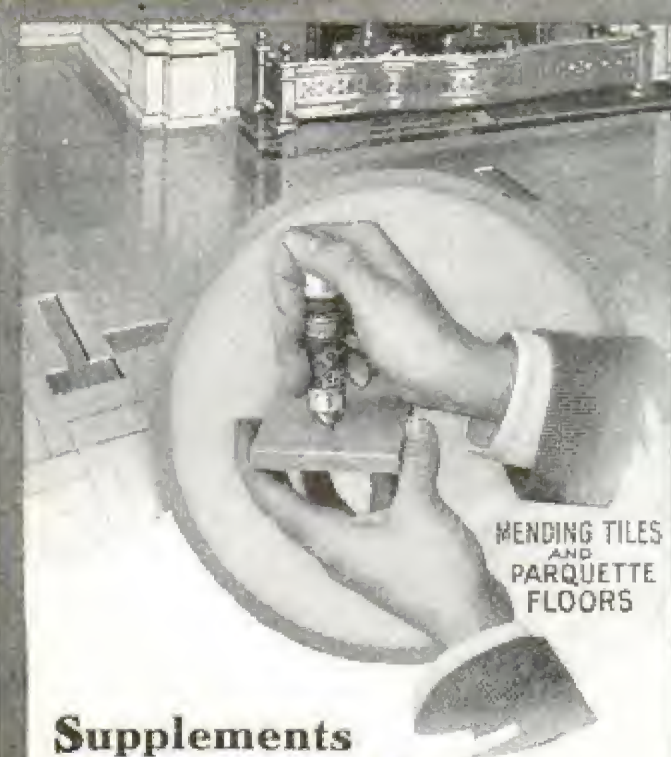
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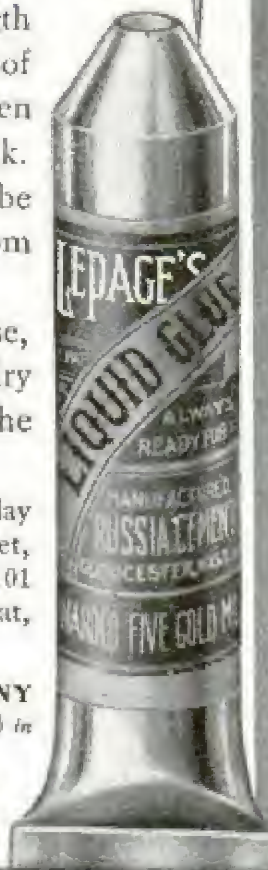
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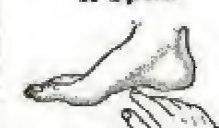
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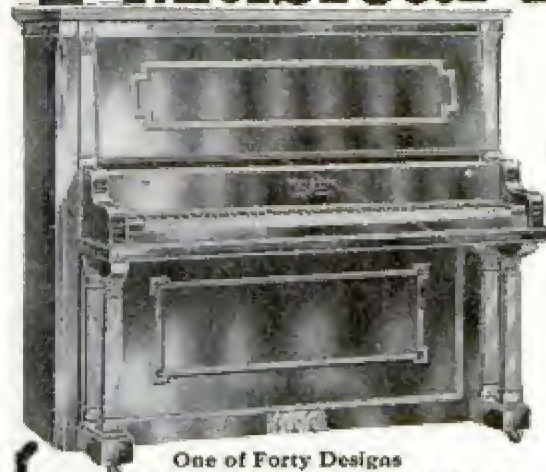


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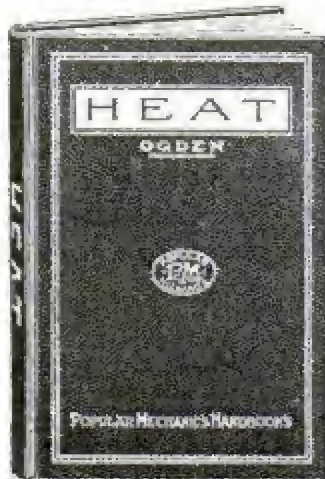


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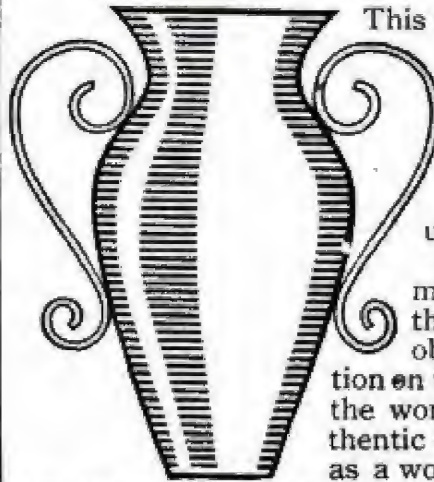
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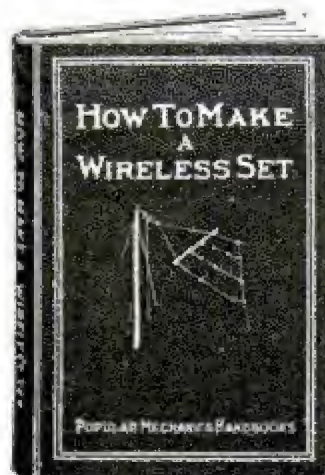
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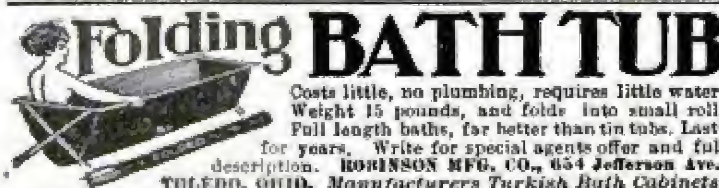
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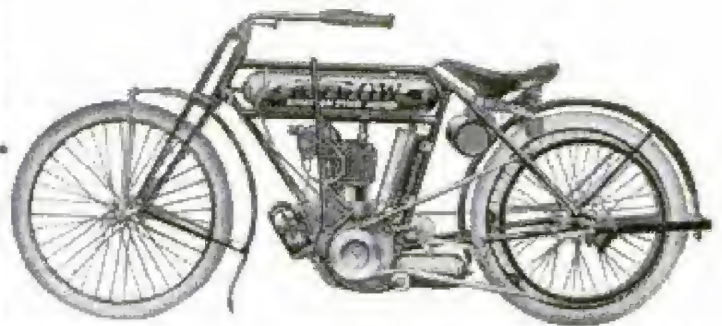
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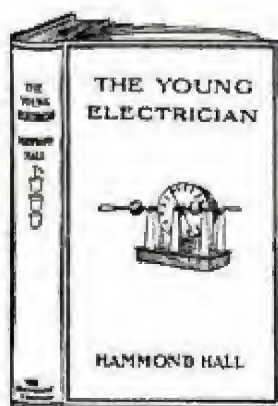
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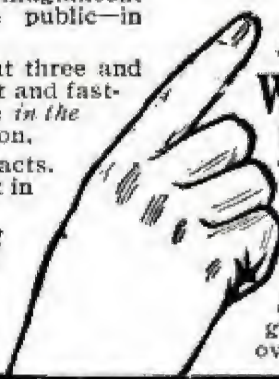
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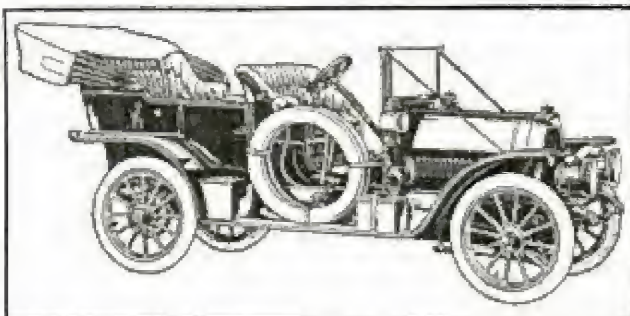
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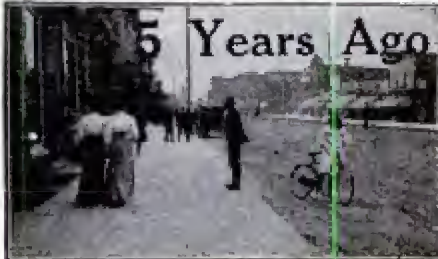
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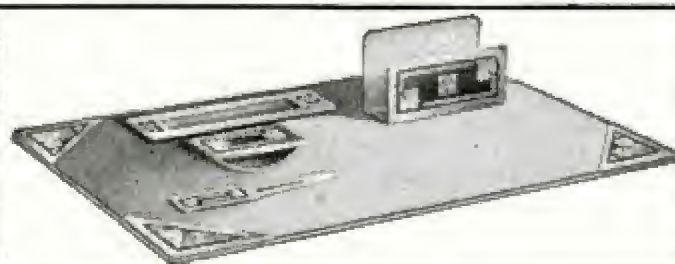
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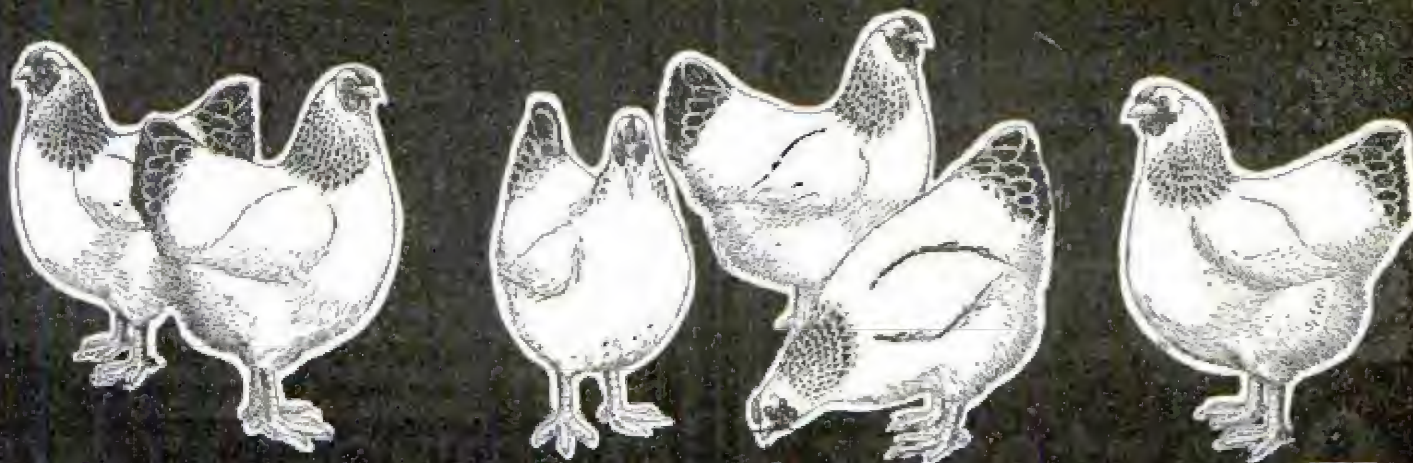
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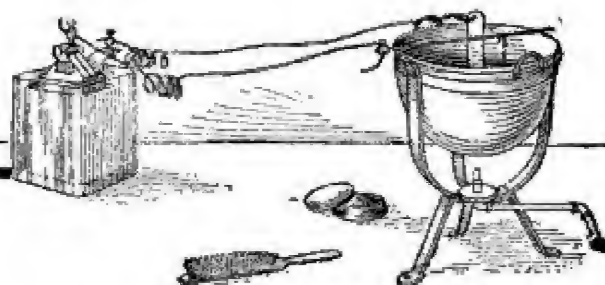
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By
FRANKLIN O. KING

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Inside the House was the Table spread with snowy linen, the Big restful Beds, the Old Open Fireplace, and the old Family Bible, holding the simple annals of the Family and the Heart and Conscience of the Home. And when you came Home from the Fields, there was always assurance of good Things to Eat when You "Put your feet under Father's Table" for Mother was There to See to That.

In those days Father was to you The Greatest Man in all the World, and you still revere him as A Grand Old Man. He was just a plain farmer, a simple, upright man, with no Mortgage on his Roof, no Lien on his Growing Crops, Master of His Land, and Master of Himself.

I suppose You often ask Yourself why You didn't stick to the Old Home, with its assurance of Peace and Plenty. I Know Why. It was the *Call of the City*. It Lured You and Fooled You, just as it has thousands of your Fellows. You have long since learned that your Progress in the City was more apparent than Real; that You are Like the Slave on the Treadmill—always striving, but never really getting on.

And so, Today, there is Another Call that Tugs at Your Heartstrings and makes You Resolve for the Future. It is the *Call of the Country*. It is a Call that is Ever Old and Ever New, and it is Growing

* * *

Please send me your book "Independence With Ten Acres."

every Day. More and More Men are leaving the dust and grime of the City's Streets, and taking their Children out into the Clear Sunlight in the Country, where they will be as Healthy and Happy as You were in your Boyhood Home.

How about You, My Friend? Why don't You give your Boy and Girl a Square Deal and an Even Chance? You ought to Try and give Them a *Real* Home, and You ought to start NOW. And I would Further advise you to get a Home in the Rain Belt of Gulf Coast Texas, where you can grow Three big Crops a Year on the same Soil, without Irrigation or Fertilization.

I believe you could save Thirty-three Cents a Day if You tried. I know you would Try if you Realized that our Growers of Figs, Strawberries, and Early Vegetables clear a net profit of \$300 to \$500 an Acre. Men have Realized more than \$1000 an Acre growing oranges in our Country. Remember

that our Early Vegetables get to Northern Markets in Mid-Winter and Early Spring when they Command Top Prices.

What would You think of a little Town of about 1200 People situated near our Lands, where they ship on an average of \$400,000 worth of Fruit, Vegetables, Poultry, Eggs, etc., a Year? During 1910 this Community shipped nearly \$100,000 worth of Strawberries alone.

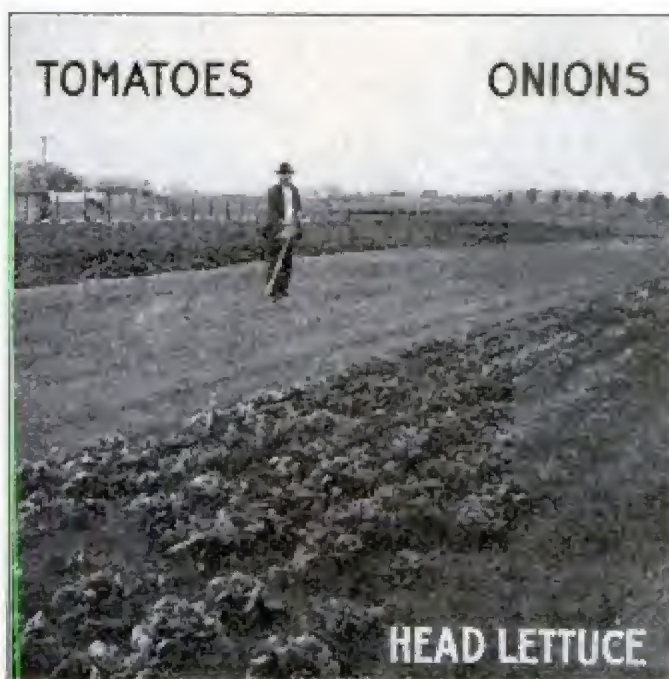
We are situated within convenient shipping distance of three Good Railroads, and in addition to this have the inestimable

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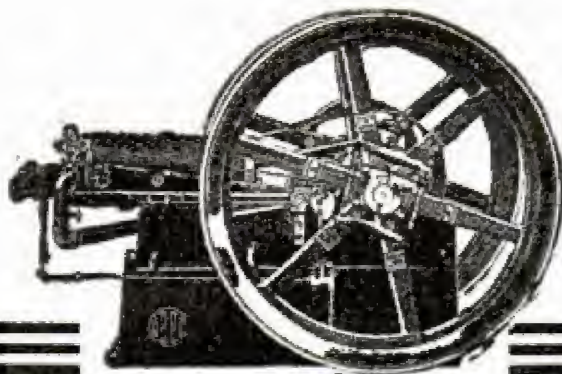
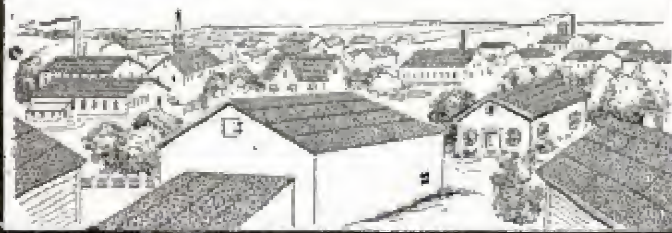
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